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SMOKELESS AIR

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NATIONAL SOCIETY FOR CLEAN AIR

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In this Issue

Studies of Urban Air Pollution ✦ Harrogate Conference and Exhibition ✦ Smoke Production and Prevention ✦ International News ✦ Britain's Electricity

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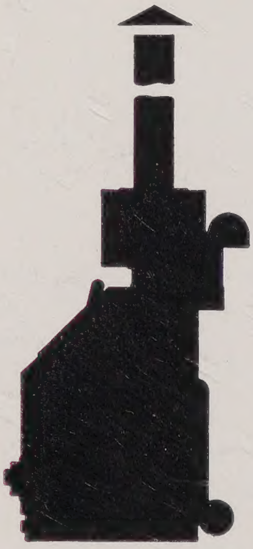

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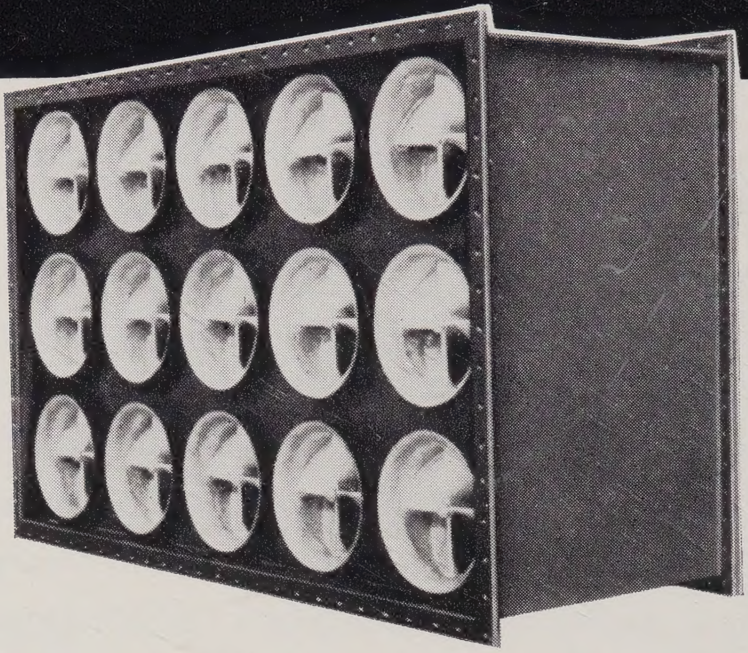

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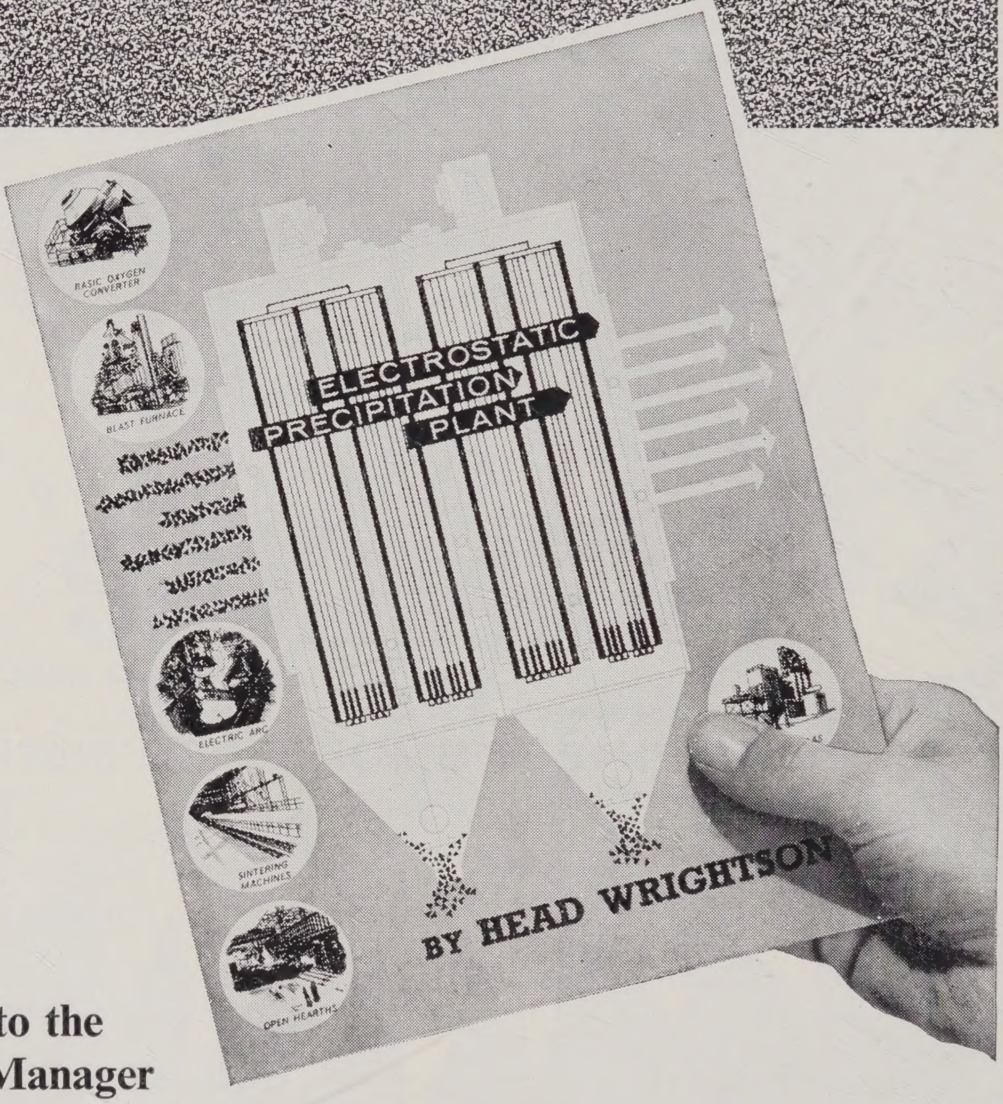

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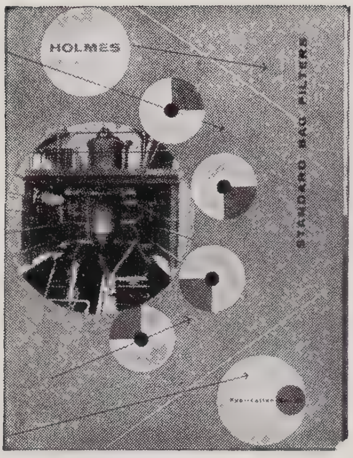

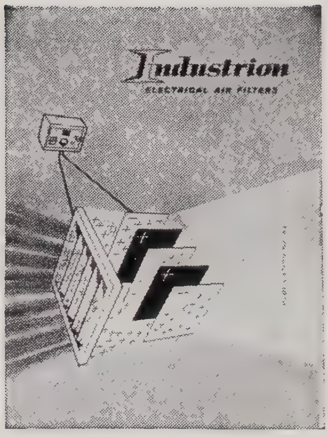

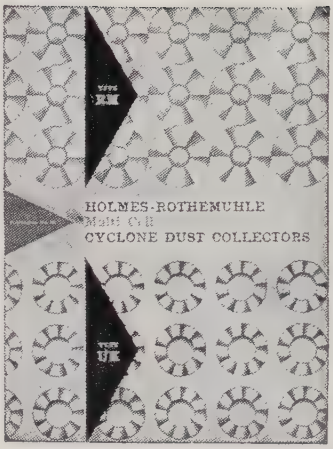

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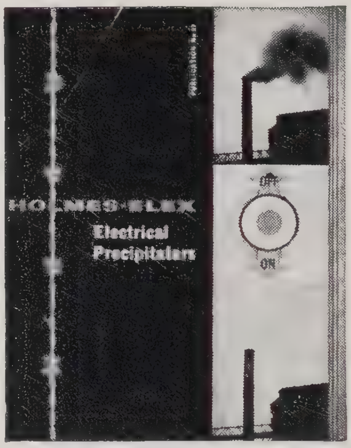

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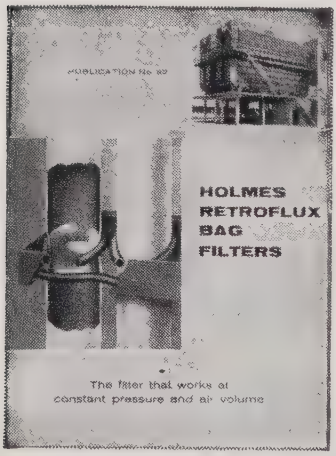

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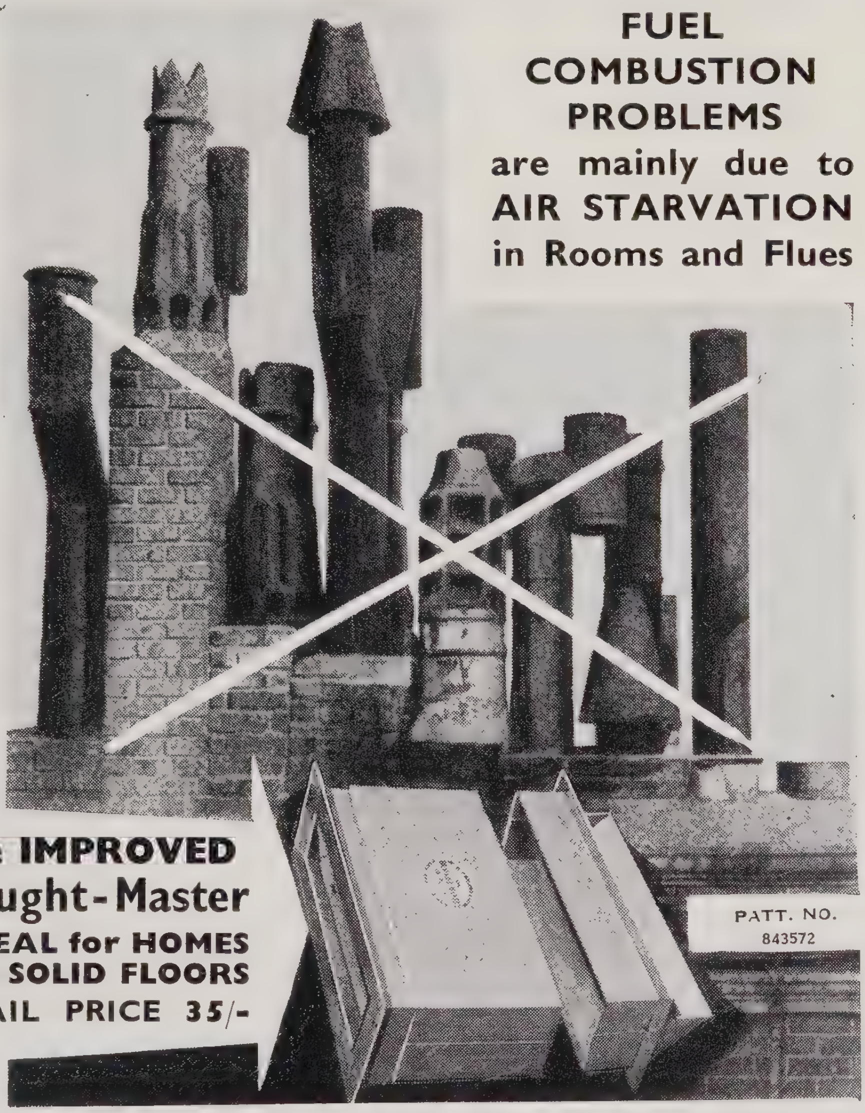

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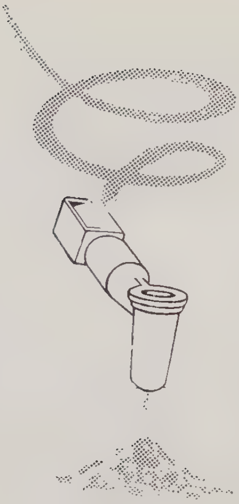

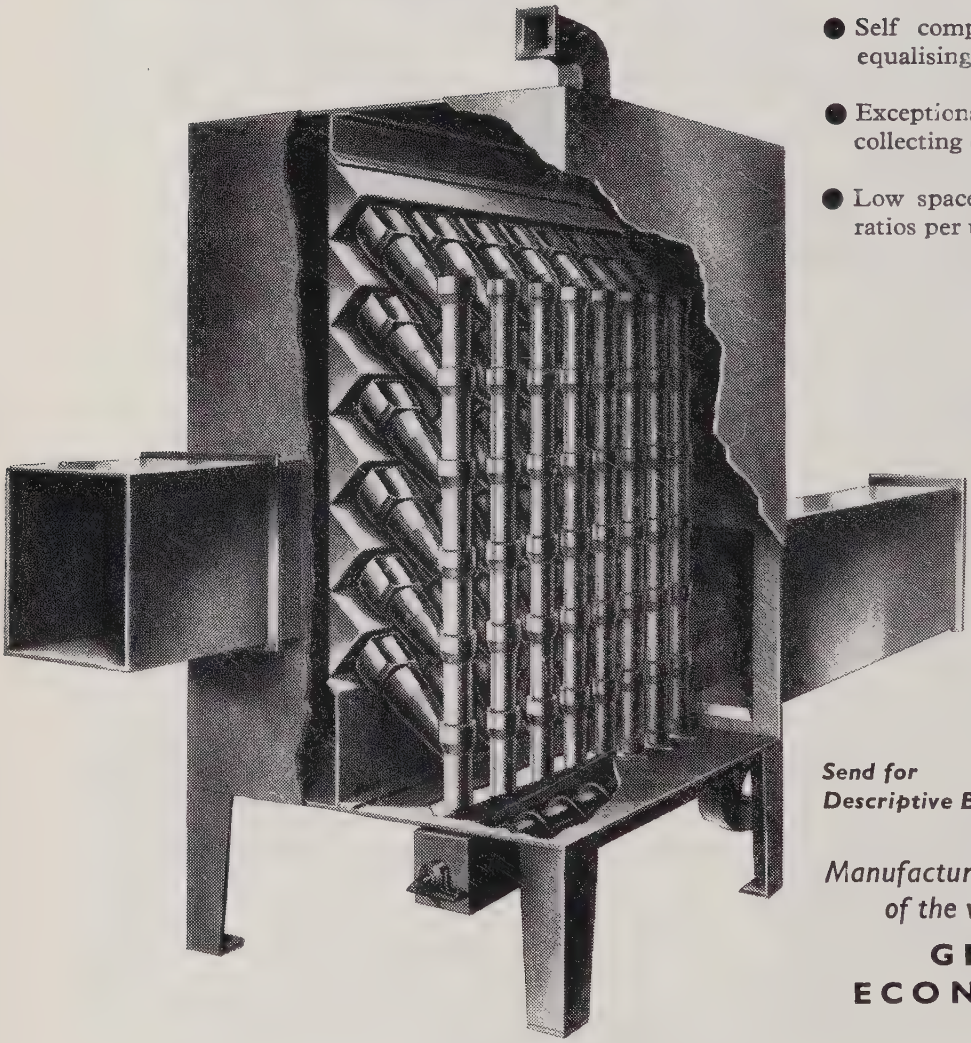

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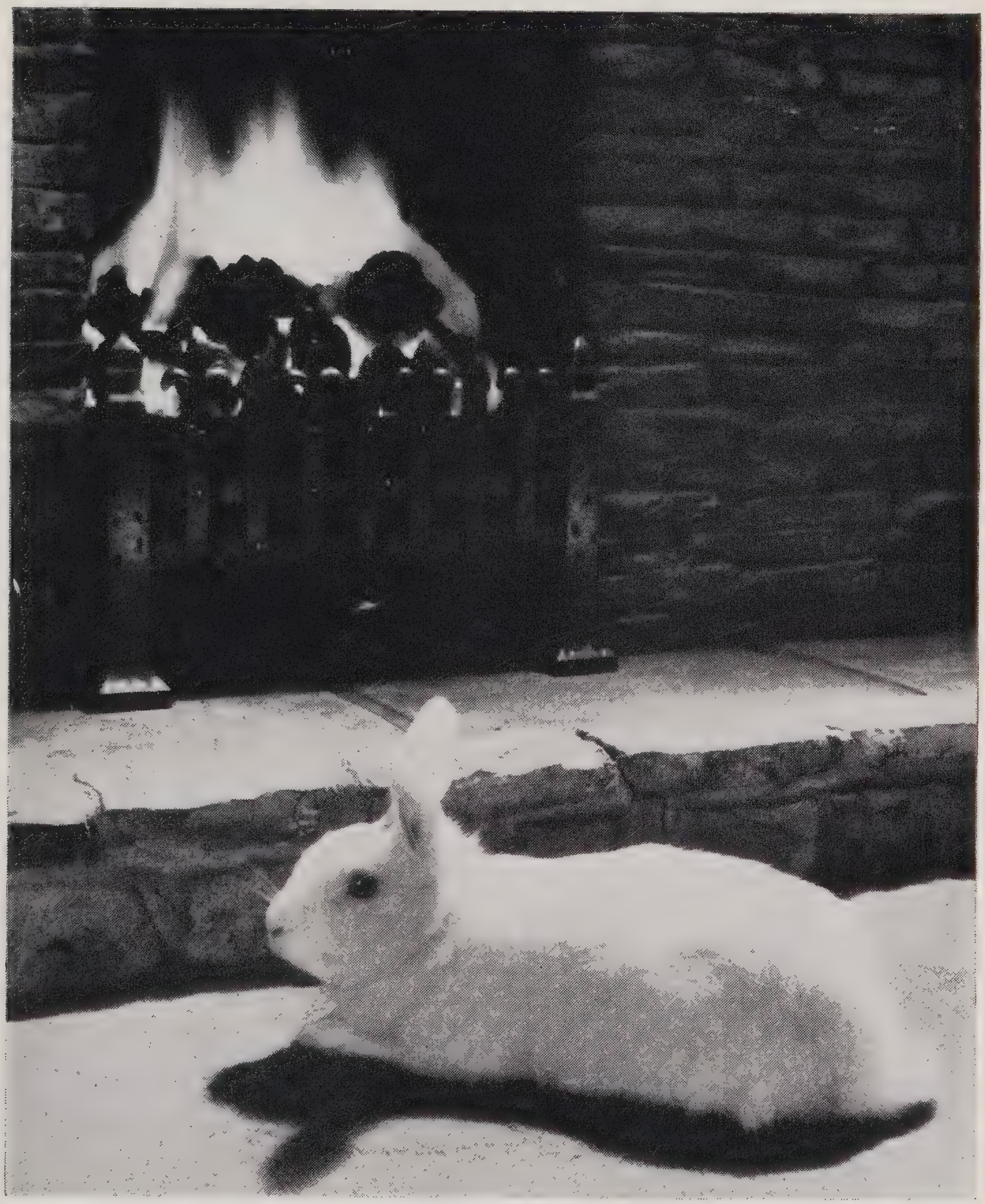

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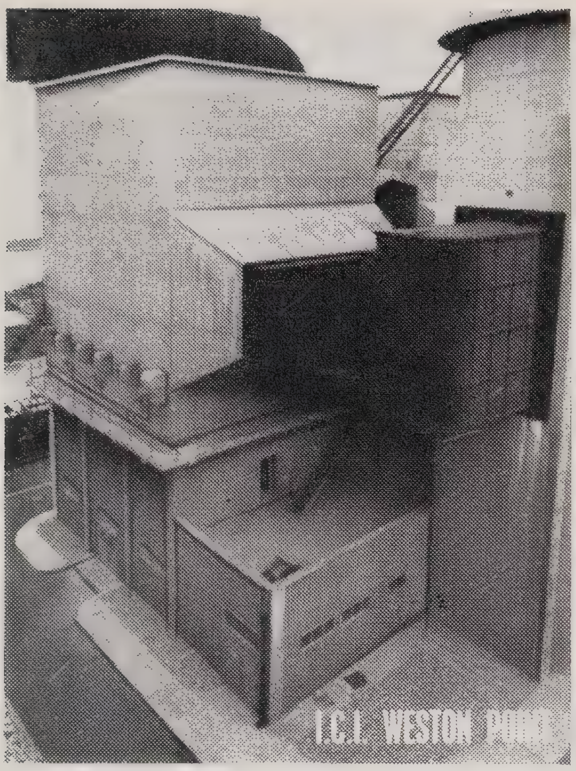

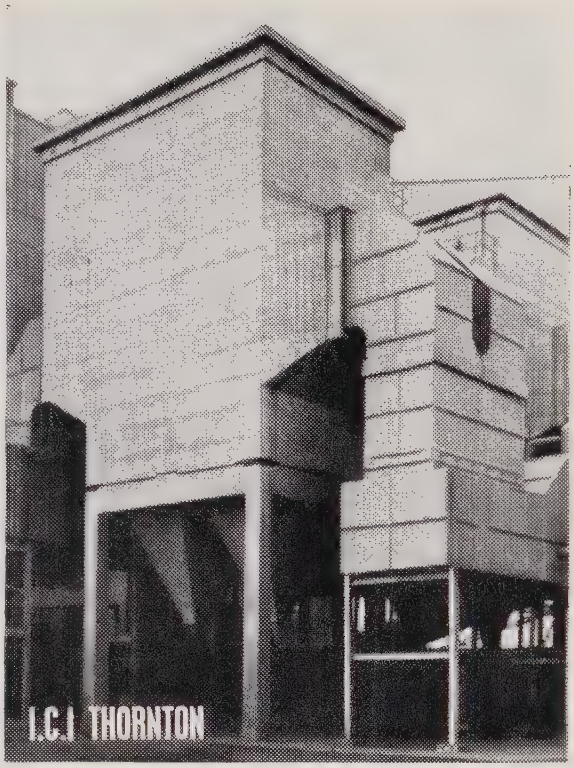

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Field House, Breams Buildings, London, E.C.4 (CHAncery 5038)

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MEMBERSHIP of the Society is invited and is open to individuals, local authorities, firms and other corporate bodies. Full details and membership application forms will be sent on request.

NOTICES

Harrogate Conference and Exhibition—Information and registrations from the Society's office up to October 5. Fee: $3\frac{1}{2}$ gns. Exhibition invitation cards and admission tickets gratis on request.

General Meeting—Owing to a last minute change of arrangements the duplicated letter which accompanied the formal printed notice of the Extraordinary General Meeting wrongly referred to the date as October 10. The date is as in the printed notice: October 9, at 4.00 p.m. in the Royal Hall, Harrogate. (*For members and their representatives only*)

North West Division, Bolton Meeting—See page 47 for information about this important meeting. Further details from the Divisional Hon. Secretary, Mr. R. J. Stanyard (address above).

Legacy—Members are asked to note the paragraph on page 23, relating to a bequest to the Society. Such legacies are most helpful and members are invited to consider the Society in their own Wills.

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SMOKELESS AIR

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Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

THE DIESEL SPOT CHECKS

THE Ministry of Transport's recent " spot checks " on diesel vehicles for fumes emission have been given good publicity and are to be welcomed. They are gratifying to this Society because they are pilot tests for the kind of control we have been advocating. In the statement submitted to the Ministry last year, and discussed at the Brighton conference it was urged that the Ministry's Vehicle Examiners be increased in numbers and that the action they were already taking on a small scale be greatly expanded. The Examiners have powers to put badly smoking vehicles off the road or to require them to be serviced, even though they do not possess powers to halt moving vehicles.

On its first check, made at 133 points throughout the country, 30,000 vehicles were observed, of which 3,600 were emitting more smoke than was necessary. Fifty were " put off the road ", and in other cases orders were issued that the vehicles should not be used after a specified number of days unless first put right and produced for inspection.

Now that it has been shown what can be done by this procedure we hope that it will become routine and carried out at many more, perhaps varying, points.

The advantages of this form of control are three. In the first place no new legislation, with all its attendant delays, is called for. Secondly, because it is based on the visual observations of experienced, technically-trained persons, it does not require the use of frequently suggested but still non-existent instruments for measuring the density of the smoke, to wait for which would cause more, perhaps indefinite, delay. Thirdly, it eliminates police court proceedings, which apart from their cost to the community, are likely to be taken only when emission is excessive and a conviction probable.

The procedure that seems to be evolving is in fact analogous to that under the Clean Air Act for dark smoke emissions from a chimney. Although there is a specified standard, based on the Ringelmann smoke chart, " the court may be satisfied that smoke is or is not dark smoke as hereinbefore defined not withstanding that there has been no actual comparison thereof with a chart of the said type", A chart of the Ringelmann type could not be used for vehicle emissions, and although there are instruments which when installed on a vehicle can measure the density of the smoke at the point of exhaust, there is nothing to measure from the roadside the smoke of a passing vehicle. There has been much talk about such a device, but it seems to be neither likely nor necessary.

Again, the smoke inspector under the Clean Air Act does not wait until he is certain that an offence is being committed and then take proceedings. Long before that he has been warning, discussing and inspecting, and a summons would come only after all else has failed. The parallel with road vehicles is not exact, but there are similarities, and the object in each is the same—the prevention of smoke through efficient combustion.

NPY

National Productivity Year, organized by the National Productivity Council, with the Duke of Edinburgh as Patron, and supported by many leading firms and organizations, opens in November. The Society is being associated with it, and our President, Lord Cohen of Birkenhead, has accepted an invitation to represent the Society as a Vice-Patron.

Why the Society should be concerned with a campaign that in the main concerns industry and economics will at once be obvious to those of our members who have studied the economic consequences of air pollution. The enormous economic cost of pollution is sheer waste of labour, materials and fuel, and is a cause of what may be called unproductivity. An especially important factor is the loss to national productivity of working days lost through illness caused by or aggravated by air pollution. We will not expand on this at the moment, because it is hoped that Lord Cohen will discuss it in his Presidential address at the Harrogate conference in October. But we hope to feature the subject in later issues and in the meantime wish every success to an effort that can do much to lift up the nation's standards of efficiency in every walk of life.

New Grates for Old

We have had to disagree so frequently with its views that it was a pleasure to read an article recently in the *Coal Merchant and Shipper* that was helpful to clean air, could be read with profit, and fully supported. It was on a question that one of our own committees is studying: that of cases where a grant for new grates has not been applied for when a smoke control area is declared, and the situation which arises later, perhaps years later, when a new tenant or owner occupies a house that has not been adapted for smoke control and in which it is now desired to use smokeless fuels for which improved appliances are necessary. At such a later stage a grant can be obtained if the local authority serves a notice requiring the conversion to be made. This may not be possible, or may be difficult, and anyhow cannot be regarded as desirable, especially as time goes on.

The incoming owner or tenant is at a disadvantage if he goes into a house where he will wish to make conversions, and the previous owner or the landlord will be at a disadvantage in selling or letting. The *Coal Merchant* urges that the facts of the situation be made more widely known, especially to estate agents and architects. Local authorities are doing much, but it seems that much more could be done —perhaps by the fuel merchants themselves—and we fully endorse the journal's appeal.

Why the Unconverted?

For many houses in smoke control areas no requests are made for conversion grants. In some cases, it seems, new appliances have been installed without troubling to apply for grant; in others the old appliances continue in use because the householder prefers to burn only the free-burning or premium fuels. In some instances, according to the *Coal Merchant*, the householder has been under the impression that, by accepting a grant, he would jeopardize his right to claim ownership of the new appliances. It is where the old appliances, such as the stool-bottom grate, continue in use that the position should be made clear and conversion encouraged.

The main reason for this is of course that with the improved grates any type of smokeless fuel may be used, and such grates are essential for what will continue to be the most abundant fuel, coke—or rather Gloco. In addition, and this should be put to the unconverted, much better value for money is secured if the new appliance is a convector open fire or a closable stove. Without a modern appliance the householder is restricted in his choice of fuel to fuels which may at times be in short supply or which cost more than he (or his successor) wishes to pay.

Because of this it is regrettable that there should still be local authorities who believe that they should delay their smoke control area programmes because there may be enough free-burning smokeless fuel in the future to make it unnecessary. This is unlikely and such a policy is also unfair to those who prefer to burn a cheaper fuel. The argument has been met with in England, but seems more prevalent in Scotland, where the Scottish Development Department has recently issued a circular to local authorities explaining the facts and making it clear that such a policy is mistaken.

Shoppers Guide

Much publicity and controversy followed the report in *Shoppers' Guide* on solid smokeless fuels and the problems of quality and excessive moisture that are sometimes experienced. We have discussed these problems over many years in this journal and at meetings of the Society, and it is useful that fresh attention should be directed to them. The report, and apparently even more, a television programme on it, have been criticized for giving a generally too unfavourable impression of smokeless fuels, and therefore of being unhelpful to clean air. On the other hand, in the long run, good may have been done in stimulating improvements in quality control and storage.

Our own criticism, apart from matters of detail, is slightly different. To highlight faults and shortcomings in something that in general is very good, is useful if it is part of an overall review that also discusses the good and desirable features. This the report did not do; it was restricted to certain features that were open to criticism. The trouble, we feel, was not in the report itself, or in its publication, but rather in its publication in isolation.

Meeting Extraordinary

As forecast in our last issue it is now being formally proposed that the Society's minimum rates for membership be increased. Members and representatives of members will have received the notice of an Extraordinary General Meeting to be held at Harrogate at the time of the annual conference in October, when the necessary amendments to the Bye-Laws will be proposed on behalf of the Executive Council. That such increases should be required is regretted, but in the face of continuing inflation, with which a voluntary society has difficulty in keeping pace, it is an inevitable step from time to time, and the last increase was in 1958 (for individual members in 1952). For Corporate and Local Authority members, from whom there are varying rates, the proposed increases are around 20 per cent. If the proposals are approved the changes will take effect from January 1 next.

The amount by which the Society's subscription income will be augmented will however be only about 10 per cent. The reason for this is that many of our Corporate members subscribe well above the minimum rate, and these more substantial contributions will not of course be affected. For a further improvement in our resources we must seek new support or persuade the Corporate members to help us still more generously—perhaps also by a 20 per cent. uplift?

A substantial part of the income comes from those who are very rightly designated as " Sustaining Members ", which means a subscription of £100 or more per year. Up to now, we may point out, there is not one local authority among these members. *Verb sap?*

Studies of Urban Air Pollution

Medical Research Council Review

A valuable review of the effects of air pollution upon human health is included in the Report of the Medical Research Council for 1960-61. (H.M. Stationery Office, 21s. net.) The first part of this describes the nature and distribution of air pollution, and after discussing the smoke and sulphur dioxide, reference is made to the less familiar oxides of nitrogen:

" Oxides of nitrogen are formed from atmospheric nitrogen when fuel is burned at high temperatures, and nitrogen dioxide is known to be a respiratory irritant in the concentrations in which it may be found in industrial atmospheres. Nitric oxide also merits attention. It was earlier believed that this gas could have no separate harmful effect, because it would be rapidly oxidized to the dioxide; but the new analytical methods have made it possible to determine the individual concentrations in the atmosphere of the various oxides of nitrogen, and nitric oxide has now been found to be present in town air in concentrations exceeding those of the dioxide. As yet little work has been done on the toxicology of this gas and the significance of its presence in the air is uncertain, but it is known to have a more powerful affinity for haemoglobin than carbon monoxide, which can asphyxiate—for instance, in cases of poisoning by domestic coal gas—by displacing oxygen in the red cells of the blood."

On carbon monoxide, which is emitted by petrol engines, it is said that " in calm weather the concentrations in busy streets frequently exceed those usually considered the maximum permissible for eight-hour exposures in industry ". The Air Pollution Research Unit monitors the concentrations of carbon monoxide in London streets, using infra red analysis, and has begun to study blood levels of the gas in motorists and policemen.

Reference is made to the tar present in coal smoke, which is rich in polycyclic aromatic hydrocarbons, and to new techniques for determining the quantities.

The review continues: " Blackness is the property of particulate pollution which is most frequently used to measure its concentration in air. Before the introduction of the Clean Air Act led to a change in fuel habits in this country the darkness of the stain produced by a sample of air on a filter paper was a fair measure of its contamination with solid matter. Increasingly efficient combustion has led to less blackness, but this is not necessarily associated with a commensurate reduction in the amount of solid matter which is present. Since inter-urban and international comparisons of pollution are continuing to be made on the basis of the measurement of blackness, the changing relationship between blackness and the concentration of solid particles in the air is being examined as a matter of urgency ".

Acute Effects

The effects of smog episodes on mortality, and more sensitively, morbidity, are discussed, and the following paragraph may be quoted in full:

" The irritant effect of high pollution on bronchitic patients appears to result in a narrowing of the bronchial tubes, which increases the resistance to air entering and leaving the lungs. The effects of various constituents of pollution have been studied in normal people and in bronchitic volunteers, but concentrations such as may be found in the atmosphere have so far failed to produce significant alteration in pulmonary function. However, significant increase in airway resistance can consistently be produced in some people by allowing them to inhale sulphur dioxide in concentrations about five times as great as the maximum found in London. There is evidence from animal experiments in America that the addition of inert aerosols to sulphur dioxide enhances its effect, and this synergistic action is being investigated in the Air Pollution Research Unit. It might reasonably be expected that sulphuric acid droplets would be more irritant than sulphur dioxide, but experiments with sulphuric acid mists in concentrations commonly found in urban air have so far proved negative; this, however, may be because the acid droplets prepared in the laboratory take up water when they are inhaled and are therefore quickly diluted. In the air, acid is often found in association with solid particles which may protect it from this diluting effect of the moist respiratory tract, and attempts to produce such ‘ protected ’ acid for inhalation experiments are being made in the laboratory.”

Chronic Effects

“ It is clear,” states the report, “ that intense pollution can produce acute clinical effects in susceptible persons. It is also probable that long-continued pollution of lesser degree may play a part in the development of chronic bronchitis and other pulmonary diseases.” Studies of bronchitis are described, and the report then looks at the relationship of air pollution to the incidence of lung cancer. On the possible effect of town air, with its higher content of potential carcinogens such as 3:4-benzpyrene, it is said “ There is evidence to suggest that the higher death rate may be found among both tobacco smokers and non-smokers; but by itself air pollution cannot be responsible for many cases, since even in large towns the incidence among non-smokers is small . . . Since the smoke concentration in cities and towns has been diminishing for some years it is hardly possible that it can be causing the continuing rise in the incidence of lung cancer, and other possible sources of pollution are being investigated. The exhausts of motor vehicles have often been suggested as a cause, though as yet there is no evidence of increased liability to lung cancer among those who are exposed to high concentrations of motor exhausts ”.

The final section of the report is on protection from pollution, and to the “ urgent problem of providing protection for the aged and the ill during severe fogs and other weather conditions that cause pollution to accumulate to a dangerous extent ”. Attempts are being made to devise air conditioners suitable for emergency use in homes and hospitals.

Report on a Smoke Control Area

Like most aspects of life and affairs, smoke control areas make news when there is some difficulty or controversy. When all goes well—as it has with nearly all the 600 odd areas now in operation—they are accepted and are given little comment or praise. It is therefore interesting and salutary to take the opportunity of recording the success story of one particular smoke control area, which is all the more significant because it is in a mining district, and moreover a mining district in the north-east. It is a report, by Mr. J. Donkin, Honorary Secretary to the Northumberland and Durham Local Authorities’ Clean Air Committee, and relates to the Felling No. 1 Smoke Control Order. It says:

“ The above Order came into operation on May 1, 1962, and as the area which it covers includes more residential properties, *i.e.* some 3,876 houses, in an area of 350 acres comprising the Leam Lane Estate, than in any other Smoke Control Order in this part of the country, I thought that members of the Committee would be interested to know of the experience gained from the introduction of this

Order even though its time of operation has been limited.

" The Order was made more than two years ago and the usual objections were made, *i.e.* that residents were perfectly happy burning coal; that they did not believe coke would burn; that it would be too expensive to use coke and possibly the biggest objection came from miners who were in receipt of concessionary coal.

" During the six months before the Order came into operation, the Council, by publicity and by visits from Public Health Inspectors, impressed upon residents of the Estate that the Order was to come into operation and two mobile exhibitions on the Estate at various times were almost overwhelmed with the numbers of visitors. In fact, each mobile exhibition said that this was the most worthwhile visit they had paid to any town in the whole of the country. The Northern Gas Board in conjunction with the Solid Smokeless Fuels Federation issued a free sample of Gloco and so far as possible all grates were inspected to see that they had the regulation space of ⅝ in. between bars. Subsequent to the new national agreement on the supply of smokeless fuels in lieu of concessionary coal, the miners not only withdrew their opposition to the scheme but actively supported the same and the National Coal Board, working in close co-operation with the Council and the Local Miners' Lodges, made arrangements for the Gas Board to supply Gloco at the appropriate time. The Gas Board authorized local coal merchants to supply Gloco and the consequence was that on May 1 the Order came into operation with considerable less difficulty than anyone had imagined. The Council had let it be known that as the holding of some coal stocks on May 1 was unavoidable they would not be taking any proceedings during the ' settling down period '.

" On May 10 a check was made in the area and it was estimated that smoke was being emitted from about 2 per cent. of the houses on the Estate. This percentage has dropped each day as coal stocks were exhausted.

" Not one legitimate complaint has been received from any person on the Estate since the Order came into operation. The few complaints which have been received have been easily remedied because they arose from defects in the grates. A local secretary of a miners' lodge with 178 miners living on the Estate has told me that he has spoken to at least 150 of these miners and they have all said they are extremely satisfied and would have no wish to burn coal again. It has been known for visitors to the Estate to come to the Health Office and ask if they can have their fireplaces converted to enable them to burn Gloco and women residing on the Estate have expressed their satisfaction that washing hanging out to dry remains clean. A vast improvement can be observed in visibility and the benefits of the Order coming into operation will no doubt become more apparent in due course. Many residents on a nearby Estate with almost 1,000 houses are already expecting that the Council will make a Smoke Control Order to cover their Estate and some have said that in the light of experience gained on the Leam Lane Estate they can raise no objection to such a proposal.

" I hope that the observations set out above will be of interest to members of any Council contemplating making Smoke Control Orders."

Edinburgh Survey

The Department of Geography at Edinburgh University is to undertake a special systematic survey of air pollution in the city, sponsored by the D.S.I.R. Its object is to learn more of the distribution of pollution and the effect of smoke control areas. Independently, but in co-operation with this investigation, the Edinburgh Public Health Department is studying the relationship between pollution and chronic bronchitis.

The Harrogate Conference

As we write, in mid-August, arrangements for the Harrogate conference in October are being completed, and delegate registrations have topped the 800 mark. As previously reported, Lord Jellicoe was to have opened the conference as Parliamentary Secretary, Ministry of Housing and Local Government, but the recent Government changes have moved him to another sphere. Arrangements for an " opener " are therefore at present uncertain.

The new feature at Harrogate this year will be the " Pre-Conference Technical Session ", on the Tuesday afternoon before the conference proper opens on the Wednesday morning (October 10). This arrangement may solve the problem of giving more time to technical matters without cutting down on the more general topics desired by the majority of delegates. The subject for this session this year will be air pollution problems in the iron and steel industry, and papers will be presented by three authoritative speakers from the industry. Special invitations to attend this session, as guests, are being extended to members of professional organizations in the north, such as the Iron and Steel Institute and the Institute of Fuel.

The opening session on the Wednesday morning will include Lord Cohen of Birkenhead's second Presidential Address, in which we forecast something of importance. The remaining conference sessions cover a wide field: International progress on Wednesday afternoon (including medical research progress in Britain by Dr. Lawther); Dr. Carter, the Chief Alkali Inspector on Thursday morning; a " questions and answers " session on domestic smoke and smoke control areas on Thursday afternoon, with a platform panel of many talents and Mrs. D. M. Charlton as Chairman; and finally on Friday morning Mr. Stanley Cayton with a paper that we think will promote a lively discussion, on the subject of incineration and disposal of waste materials.

The Society's exhibition, the biggest yet, will be in the adjoining hall, and a description of this is given on another page. There will as usual be an attractive conference and exhibition Handbook, containing the programme in detail. It is not too late to register, and details will be sent on request on application to the Society's offices.

Bequest to N.S.C.A.

Mr. Edwin Thomas Rayner, of Grange Crescent, Grange Hill, Chigwell, retired civil servant, who died on March 24, left £12,238 gross, £12,042 net value (duty paid £424).

He left £8,000 and such of his furniture and effects (other than motor car) as she may select to his wife and £1,000 between his brothers and sisters.

The residue is to be shared by the National Society for Clean Air, the National Trust, the National Institute for the Deaf and the N.S.P.C.C.

Cancer Congress

At the 8th International Cancer Congress in Moscow in July a British paper on experiments with cigarette smoke supercharged with benzpyrene led to the conclusion that this substance " plays only a minor role in carcinogenesis by cigarette smoke ". A South African report noted: The immigrant from Britain carries with him an increased risk of lung cancer that is not caused by heavier cigarette smoking but is almost certainly caused by the effect of atmospheric pollution on the bronchial cells.

THE ALKALI etc WORKS REPORT

Good Progress in 1961—More to come

98th Annual Report on Alkali etc. Works by the Chief Inspectors, 1961. pp. 73. H.M.S.O. 5s. 6d. net.

THIS latest report, now only two off the century, is again a substantial account of a great deal of work done by the alkali inspectorate, whose numbers are now 28, and who have responsibility for 2,098 registered works in England and Wales and 311 in Scotland. The report constitutes a valuable reference book on present-day pollution problems of many varied kinds, even though it still is without an index.

Special attention is given to the progress being made by the iron and steel industry in reducing air pollution, and in his report the Chief Inspector for England and Wales, Dr. J. S. Carter, says: " There are many unsolved fume problems and much plant still sub-standard; yet the big decisions have been made by the big producers and are being put into effect ".

The inspectorate, he says, assumed responsibility for emissions from iron and steel works at a time (1958) when radical changes were beginning to occur within the industry. The need for pre-treatment of ores before feeding to the blast furnace had become widely accepted, but not widely put into practice. The open hearth steel process responsible for over 80 per cent. of production was being challenged by the newer pneumatic processes involving the use of oxygen in tonnages quite impracticable a few years before and by the electric arc process; and on the iron foundry side a hot blast technique was threatening a cold blast cupola system which had long dominated the industry.

" All these presented fume treatment problems in a wide and expanding field in which existing information was inadequate and where firm major decisions had quickly to be made. The decisions were made and have been and are being put into effect. It is satisfactory to record that they were sound."

The Central Electricity Generating Board burned the equivalent of 60 million tons of coal (50 million as coal and the rest as oil and coke) in 1961, and a total of 100 million tons may well be reached by 1970.

" Any increased use of electricity is an advance towards the achievement of clean air. Not only does electricity perform its heating, power, etc., tasks smokelessly, but in its generation solid and liquid fuels are burned as smokelessly as practicable with due regard to grit arrestment and to discharge of combustion gases at high level. This is not to say that power stations uniformly operate free from offence. The Generating Board's system contains a wide variety of power stations of differing sizes and ages and some of these present major air pollution problems. The older power stations, most of them pygmy by modern standards, can present a problem out of all proportion to their size. Many of them date from an era when standards of grit arrestment and chimney height were lower than those currently considered acceptable. It was the view of the Committee on Air Pollution (Cmd. 9322), and one which I had regarded almost as an instruction, that stations which are inadequate in these respects should cease to operate by 1964. The Central Electricity Generating Board have indeed collaborated and some 70 stations with a total capacity of about 800 MW have been closed over the past five years."

However, as a result of the recent upsurge in demand for electricity, some of the older power stations may have to continue in use beyond 1964. They will be used only for peak load periods—for days yearly rather than weeks.

The report says also that the C.E.G.B. " are well aware of their responsibilities and it is their policy that the same degree of attention be focused on high standards of grit arrestment plant and the control of chimney emissions as has already been successfully placed on the attainment of low capital cost and high thermal efficiency ".

The number of complaints investigated by the alkali inspectorate again decreased in 1961; they concerned 283 works compared with 292 in 1960, 354 in 1959 and 133 in 1957, the year before the scope of the Act was greatly extended to include many other operations (for example, iron and steel manufacture and electricity production). The total number of visits and inspections carried out during the year was 10,583 compared with 9,861 in 1960. The number of analyses of industrial waste gases was 6,992 compared with 3,724 in 1960. Most of this increase was due to a special investigation concerning salt glazing of earthenware, where 3,065 tests were made, compared with 1,060 in 1960.

As in other years, the degree of justification for complaint varied and was often most bitter against some of the smaller works. Complaints were most numerous against ceramic works (37), gas and coke works (33), electricity works (31), iron and steel works (27), cement works (13) and aluminium and copper works (12 each). There were also 13 complaints against the overall emission from an industrial area rather than against any specified works. Examples are the blue brick making area of Staffordshire and the Thames and Medway cement making area.

THE OMBUDSMAN OF STINKS

While the country waits to know what the Government thinks of the Common Market it may seem a small matter to speculate on what the Treaty of Rome would mean to an Alkali Inspector. Speculation is prompted by the appearance of the 98th Annual Report of the Chief Inspectors. Will the 100th report be the signal for reviews and analyses in *Chemie-Ingenieur Technik* or *Chimie et Industrie?* If Britain is by then in Europe, the reviews should show up some of the national differences in approach.

The Alkali Inspector is a reflection of the English Constitution in all its subtlety. He epitomizes Common Law and natural justice with all its advantages over the *Code Napoleon* or any system erected on a written constitution. He represents continual advance by the workings of conscience and conciliation against stagnation followed by revolution and regulation. What he is is common sense.

—Editorial in the " Industrial Chemist "

Scotland

In his annual report to the Secretary of State for Scotland the Chief Alkali Inspector for Scotland, Dr. E. A. B. Birse, comments on the good progress being made by industry generally towards reduction of air pollution in contrast with the slow progress with reduction of pollution from the domestic fire. " Industry as a whole has committed itself to spending very large sums of money on the reduction of air pollution. For example, when in March, 1961, the Hon. T. G. Galbraith addressed in Glasgow representatives of local authorities meeting in conference to discuss control of smoke from domestic fires, he told them that the Scottish iron and steel industry alone was spending some £6 millions on control of pollution in the period from the passing of the Clean Air Act to 1963."

Dr. Birse also refers to the substantial sums being spent by the Electricity Generating Industry, and quotes as an example the £2½ millions to be spent on pollution control in new generating stations for which plans were announced in 1961 by the

South of Scotland Electricity Board.

Dealing with particular problems in the iron and steel industry, the report records that progress is being made in reducing fumes from the refining of steel by the use of oxygen in electric arc furnaces, a process which, particularly in large plants, has given rise to justifiable complaints. One firm in particular have devised a treatment which attracted attention in the industry by its relative economy in cost of installation and operation as well as its efficiency in suppressing fume emission.

The report points out that the electricity generating industry has the greatest potential of all for dust discharge and that the difference between achieving 98 per cent. and 99 per cent. arrestment in electrostatic precipitators can mean tons less dust going into the air in a day. Nearly 3½ million tons of coal were burned in Scottish generating stations in 1961. In general the control of dust discharge was satisfactory, but guaranteed performance of arrestment equipment is still to be achieved in two or three power stations.

In contrast to the position in England and Wales the number of complaints against registered works in 1961 in Scotland was higher than in 1960—22 in 1961 compared with 15 in 1960. The report suggests that this reflects an increasing public interest in reducing air pollution. The total number of visits and inspections carried out during the year was 809 compared with 528 in 1960. Seventy-five chemical tests were carried out during the year to check whether the provisions of the Act were being observed, compared with 88 in 1960.

ROAD VEHICLE NEWS

Esso Research and Engineering Company, New Jersey, U.S.A., have patented a formula (No. 888,325) for diesel fuel that is said to be non-smoking under any road condition. It consists of 99 per cent. fuel and 1 per cent. lubricating oil, plus minute quantities of other chemicals.

An Indian policeman, Mr. J. R. Chhabra, is reported to have developed a device which eliminates car exhaust fumes by ensuring complete combustion of petrol and makes possible the running of vehicles on paraffin mixtures. Tested by the Indian equivalent of the D.S.I.R., it was found that the device produced a saving with normal fuel of 14 per cent. There was no trace of carbon monoxide or free carbon in the exhaust gases.

The Chrysler Corporation of Detroit, Engineering Division, is reported to have produced a kit by means of which inexpensive car engine adjustments can be made, cutting carbon monoxide and hydrocarbon emission by 60 per cent. without affecting performance. The kit consists of a modified distributor and carburettor, together with a special distributor vacuum valve. This alters ignition timing during deceleration and minimizes the production of hydrocarbons.

Vertical Exhausts

In the House of Commons, on August 1:

Mr. Geoffrey Wilson asked the Minister of Transport if he had considered the advantages and disadvantages of requiring diesel-engined vehicles to be fitted with vertical exhaust pipes.

Mr. Marples: Yes. In tests here and in the United States vertical exhaust pipes showed no advantages in reducing urban air pollution and there were positive disadvantages. For example, many exhaust constituents especially diesel oil smuts, are heavier than air. They are better blown out near the ground than into windows and on to the heads of passers-by. The shape of many vehicles also produces an air flow when moving that would draw exhaust down at the rear in the face of following vehicles.

Smoke Production and Prevention*

by

H. Pollard, A.M.I.Mech.E., A.M.Inst.F.

National Fuel Efficiency Service

I HAVE left the legal definitions and statutory requirements to other speakers at this Conference. This paper will be concerned with the practical aspects of smoke production and prevention. I propose to review some of the methods of firing and fuels which are likely to produce smoke, then later to suggest how some of these difficulties might be overcome.

1. *Hand Firing*

This will not be considered further or in any detailed manner. It has been introduced here in order that I can state that in N.I.F.E.S. opinion the hand firing of bituminous coal should cease. The possibility of making it comply with the Clean Air Act is so remote as to make it unwise to pursue this matter further.

The hand firing of coke continues and as this fuel is inherently smokeless it does not contravene the Act. It may, however, be accompanied by low thermal efficiency and high labour charges.

2. *Sprinkler Stokers*

In general these do not comply with the Act. The Author is aware of certain sprinklers which do comply with the Act; Conference members may also be aware of such cases. Clearly no firm will ever install further sprinkler stokers but there are cases where this stoker is doing an excellent job, its only crime being the emission of smoke and its replacement can prove extremely difficult. The difficulties arise principally due to the almost instant response of this type of stoker to changes of load, its ability to produce full load or overload with about 0·3 in. W.G. over fires and the fact that when well operated it is capable of giving a very good combustion efficiency.

These preceding cases refer to methods or appliances which are not considered to be acceptable under the Clean Air Act. I should now like to turn to other methods of boiler firing which are considered to be acceptable and to satisfy requirements of the Act.

3. *Coking Stokers*

This stoker is capable of giving a high degree of smoke abatement and good thermal efficiency. The following list sets out the practical points which may cause smoke emission.

1. Shortage of draught to meet the rate of burning.
2. Clinker formation especially build-up from the sides.
3. Very short fire.
4. Use of strongly caking coal leading to excessive disturbance of the firebed.
5. The manner in which the clinker is moved while the stoker is running.
6. Lack of turbulence.

4. *Chain Grate Stokers*

In general it is difficult to make smoke on chain grate stokers and do a useful job at the same time. We have seen smoke produced on chain grates particularly where the plant was short of draught for the required rate of burning. This in turn leads to live fire being discharged into the ashpit. This is of course a dangerous condition and a plant should not be allowed to remain in this state.

5. *Underfeed Stokers*

This machine is fairly selective in

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* Paper from N.I.F.E.S. Conference, Leeds, April, 1962. See Summer issue, page 288.

terms of fuel and if roughly handled a smoke nuisance can be caused. The list sets out the practical points which might cause smoke.

1. The use of a strongly caking coal giving excessive " coke tree " growth.
2. Carelessness in trimming fire or attending to coke tree growth.
3. Clinker formation on the tuyeres.

6. *Oil Firing*

This is normally regarded as complying with the Act. There are several faults which develop in burners or methods which are capable of producing smoke of a nuisance value.

1. Oil at too low a temperature for the type of equipment in use.
2. Coarse atomization.
3. Worn burner nozzle parts.
4. Incorrect air/fuel ratio.
5. An overall shortage of draught limiting the amount of air which can be used.

7. *Package Boilers*

These are really a variant on 6 above but I decided to include a reference to smut emission. This has arisen because of the high efficiency of this type of boiler and consequent low flue gas exit temperature. This is frequently coupled with the firm's desire to use the minimum height of chimney which will satisfy the Local Authority and also the use of the cheapest form of metal construction. This combination has brought about rapid corrosion and in certain cases smut emission due to depositions on the inside surface of the chimney peeling off from time to time. This problem of the " cold " chimney has been further aggravated by the admission of cold air at the chimney base in order to reduce the draught.

8. *Industrial Waste*

All factories produce waste to some extent consisting of wood, paint, rubber, various plastics, cardboard, paper, and other materials. These are burned in various combinations in a variety of ways, on boilers, purpose made and home made incinerators. The common faults which we have encountered have been.

1. Incinerator too large thus giving a low heat release per cu. ft. and giving a general low temperature level within the incinerator.
2. Incinerator too small thus overloading either the grate or the combustion chamber volume.
3. No secondary air device.
4. Emission of smuts or equivalent due to the absence of any form of scrubber or cleaner.

9. *Industrial Furnaces*

My mention of furnaces is only in connection with smoke emission as my colleague Mr. Hancox has presented a paper on the general subject of " Trends in Furnace Practice." Many jobbing cupolas use quantities of dirty scrap and create a smoke nuisance often emitted at a low level. The grease and dirt are driven off from the burden. The conditions at the top end of the cupola do not favour the combustion of this volatile matter and much of it will remain unburnt.

The re-use of scrap on other types of industrial furnaces may present a problem. The Works own scrap may be contaminated with cutting oil or extraneous material such as insulation may also be present. When the fuel/air ratio has been correctly set for the combustion of the fuel gas or oil, this addition of volatile matter into the high temperature zone means that for a space of time there will be a shortage of combustion air with consequent smoke emission. Intermittent brick kilns can also be selected as producing smoke which will at times contravene the Act. Where these remain hand-fired serious smoke emission can take place particularly when the kiln is working at fairly high temperature and further charges of coal are added. Here there is a rapid release of volatile matter rather similar to the furnace outlined above.

Smoke Prevention

After stating some of the causes of

smoke production let us now consider some of the factors which will minimize or prevent smoke emission.

1. *Sprinkler Stokers*

The continued use of these machines demands:

1. Good maintenance.
2. Skilled operation.
3. Adequate instrumentation.
4. Incentive.

Where the operatives are paid a bonus part of which depends upon satisfactory smoke abatement, I have seen records showing that excellent results were being maintained. This course of action can only be recommended in a very limited number of cases.

2. *Conversions*

Discussion of the Clean Air Act, sprinkler stokers and shell type boilers in the same context inevitably raises the matter of conversion. The main requirements for a successful conversion are that attention shall be paid to the following items:

1. A detailed knowledge of load pattern by day and night, by summer and winter.
2. Draught available.
3. Fuel available.

From this it will be possible to take a decision:

Whether extra boiler capacity is required.

Whether additional induced draught equipment is required.

What type of stoker can be used.

Whether a steam accumulator or hot water storage is usable or essential.

For reasons of availability and frequently for the sake of the users economics caking or strongly caking smalls are being widely used. Draught and rate of burning should be considered at the planning stage. This will avoid frantic demands for fuel changes or emergency measures in respect of draught equipment.

The fuel handling plant should receive the same consideration as the combustion equipment. The above remarks apply in general principle to both chain grate and coking stokers. One firm of coking stoker makers now provide an overfire steam jet as standard equipment. This jet is a turbulence promoter and from our own observations is a useful device.

When the load is in excess of M.C.R. a continental pattern stoker may be considered. This provides about 20 per cent. extra heating surface when fitted to a Lancashire boiler. It has been found that up to about 14,500 lbs. per hour is easily obtainable from a 30 ft. x 9 ft. diameter boiler. This conversion is only likely to have a limited application as the extra cost of this equipment would purchase new boiler plant at least equal to the extra evaporative capacity.

3. *Underfeed Stoker*

Assuming this has been correctly selected as described above, this will require a fuel of weak or medium caking property, low ash content and high ash fusion temperature. A modern stoker should provide for the admission of controlled amounts of secondary air. Pre-running and after-running of the fan is desirable. A small amount of skilled attention is required. This should include the minimum disturbance of the firebed.

4. *Oil Firing*

Attention to detail is required at all stages.

Correct installation.

Correct setting of air/fuel ratio.

Maintenance of burner makers recommended pressures and temperatures.

A very high turn-down ratio and continuous running on very light load can produce smuts especially when this is associated with an uninsulated chimney. See N.I.F.E.S. Seventh Annual Report, page 13. Where the chimney is cooled further by air admission the position can be aggravated. In my opinion we should use the following combinations of equipment.

> Brick or insulated metal stacks with automatic draught pressure control rather than air admission.

In cases where an extended turndown ratio produces very low exit temperatures, e.g. on low pressure hot water installations, the use of on/off burning with automatic damper control is preferred. This is the writer's opinion of the best method of burning heavy oils under the above conditions. The raising of the metal temperatures will undoubtedly extend the life of the stack by minimizing corrosion as well as making a contribution to the reduction of smuts.

5. *Industrial Waste*

One point which should preface our further considerations: Is the Management aware of the type and amount of material which is being burned and is everything possible being done to salvage or recover material? General considerations require that the incinerator shall be of adequate volume, equipped with primary air to give a high rate of burning and high furnace temperature. It should also be equipped with secondary air to ensure complete combustion as far as possible. With some types of material an auxiliary combustion chamber having a gas burner or oil burner is necessary. This method of after-burning has proved to be successful where highly volatile material such as rubber and cable insulation was being burned. The incinerator should be followed by a system of baffles or scrubber in order to remove the bulk of the smuts.

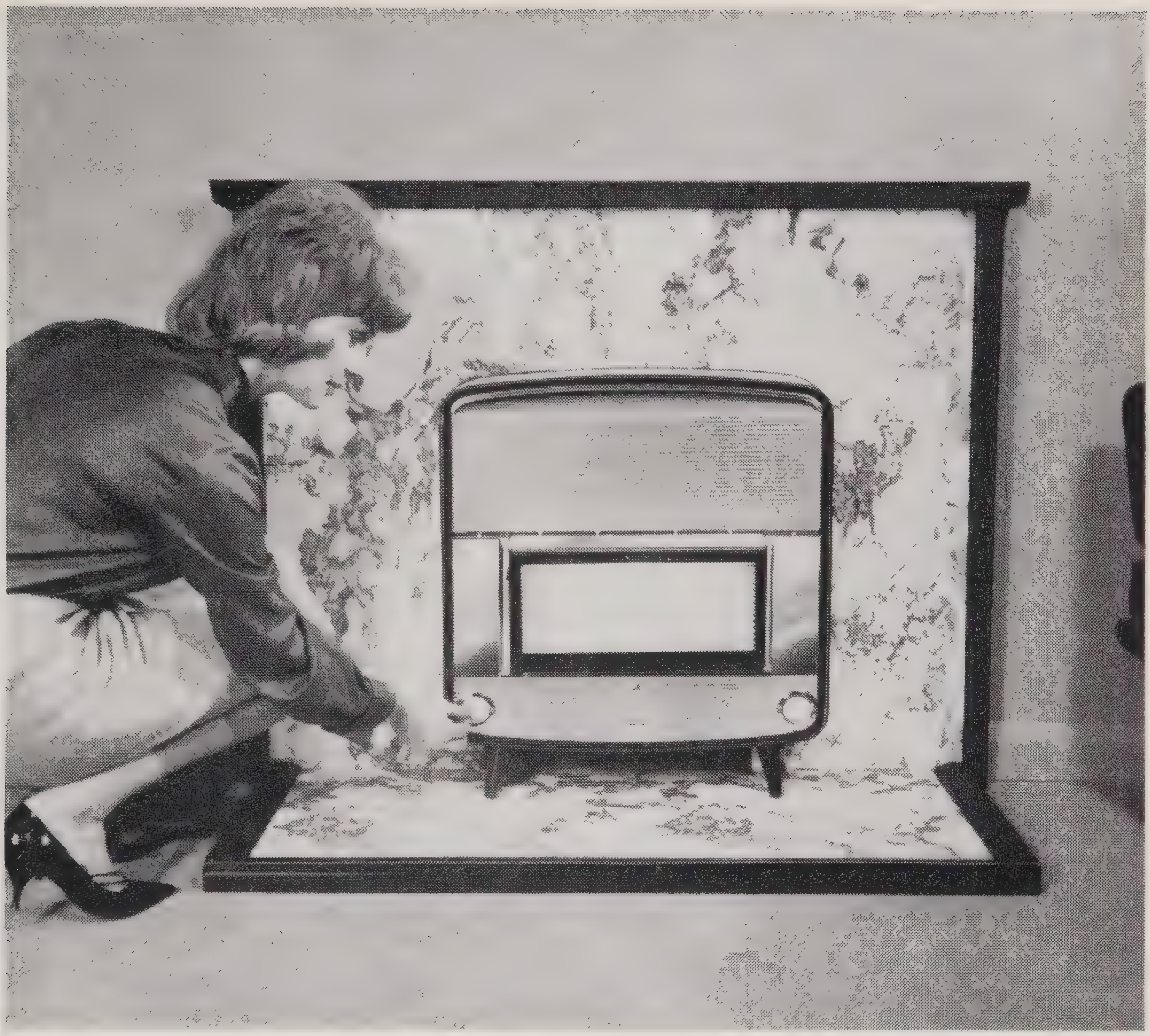
6. *Industrial Furnaces*

After-burning has been used with success on certain cupolas. In larger installations the gases are led to a combustion chamber where combustion is completed, the products are then passed through a heat exchanger. The recovered heat is transferred by this recuperator to the air blast of the cupola. 400°C. is considered to be about the safe upper limit for the air temperature entering the cupola. The cleaning of gases can be done either by means of a dry grit arrestor on the baffle principle or by a wet arrestor. In my opinion there is need for further work on this subject.

Where contaminated scrap is added to furnaces of any type, I consider it to be feasible to add this as a small percentage mixture rather than in large batches thus imitating to some extent the " little and often " principle formerly advocated for boiler firing.

I should like to mention a furnace designed by N.I.F.E.S. to reclaim metal from insulated cable. This furnace was intended to replace two existing units which had a poor performance in respect of metal recovery, they also produced a shocking smoke nuisance. This furnace was built in three sections.

1. *Main Furnace.* Three 1,000 cu. ft. per hour gas burners were installed. These burners were of a forced air draught type. The scrap material is charged and the furnace temperature raised by means of the gas burners to 800°C. Once this temperature has been attained and there is a continuous flow of material, the gas burners may be turned off. The products of combustion then pass over a bag wall and beneath a suspended arch into:
2. *Mixing Chamber.* This has two similar burners with forced air supply. Both these burners are normally in use to complete the combustion of the volatile matter driven off from the main furnace. It has been found that both burners need not be full on at all times. When the gas supply is turned off the air supply is left on to promote turbulence and to give a secondary air supply. The flue gases then pass into:
3. Final combustion and settling chamber and thence to the stack. This furnace is not followed by any heat recovery plant. It has proved very successful in respect of metal recovery. It has also been extremely effective in abating a serious smoke nuisance.



The Crystalglow

New, High Efficiency Gas Fire

The development of the gas fire, or room-heater as it is now often called, continues. The latest type is the " Crystalglow ", produced by Bratt Colbran Ltd. (one of the Radiation group), after five years of research and development.

As with the other modern fires this combines radiant and convection heating, but it has the striking new feature of having the radiant area completely enclosed behind closely fitting rods of fireproof glass. This prevents uncontrolled room air from entering the front of the fire and so cooling the radiants and diluting the hot products of combustion entering the heat exchanger that provides the convected heat. This stabilizes chimney draught conditions within the fire, irrespective of weather, flue and room conditions. The system, it is stated, gives the fire the highest overall efficiency of any gas fire manufactured today—72 per cent. Approximately two-fifths of the heat output is radiant and three-fifths convected.

The fireproof glass rods glow with the illumination of the incandescent radiants behind them, but do not impede the radiant heat. They also protect the radiants from accidental breakage and discolouration. They have been subject to the most stringent tests and in addition to being heat resistant they will not bow or dis-colour. There is no danger of shattering if any liquid should be spilt on the glass when it is hot.

Comparative tests, based on actual performances in fifty homes show that with gas at 1s. 3d. per therm on a typical two-part tariff, and with the room maintained at a temperature of 65 deg.F. for eight hours, the running cost is in the region of 8s. 10d. per week. The cost per hour, when run full on, is about 1·9d., but in the average room, at average winter temperatures, a fire of such efficiency would require to be full on for a short warming-up period only.

The illustration shows the pleasing design of the fire. It is supplied in three colours—old gold, pewter and black lustre. The front panels are of anodized reeded aluminium.

WARREN SPRING LABORATORY OPEN DAYS

Representatives of the press were entertained by the Warren Spring Laboratory, Stevenage, on June 15, 1962, when an interesting day's visit was arranged for them to attend the Preview of the Open Days. Mr. S. H. Clarke, the Director, welcomed the visitors and briefly described the work of the Laboratory's four divisions. There was then a choice of a conducted tour of each division, with experts in attendance to explain the work and to answer questions.

The work of the Air Pollution Division consists of two main parts. One is concerned with methods of reducing air pollution, such as removing oxides of sulphur from chimney gases and improving the dispersion of chimney gases. The other part of the Division's work is mapping the distribution of pollution throughout the country, so that the existing clean air legislation may be applied in the best possible way. In co-operation with local authorities, the Laboratory is organizing the National Survey of Air Pollution, based on measurements at statistically selected centres of population. Visitors saw the wall maps showing sites at which daily measurements are being made throughout the United Kingdom and it was explained how these, together with daily measurements of smoke and sulphur-dioxide already being made by other local authorities, would enable valid conclusions to be drawn about the distribution of pollution over the whole country. Instruments used for these measurements were also on show.

An exhibit of considerable interest was the measurement of diesel exhaust smoke by a light-absorption method which records the maximum levels of emission. Warren Spring in conjunction with the Ministry of Transport, is conducting experiments to see how the smoke produced by acceleration of the engine while the vehicle is stationary, compares with the smoke emitted by the same vehicle in operation on the road.

The problem of sulphur dioxide pollution is an important one, and the Warren Spring Laboratory is examining two methods of dealing with it. One is the new German " Reinluft " process which uses a dry absorbent to remove the sulphur dioxide before the flue gases leave the chimney. A pilot-scale plant has been erected on which the tests are to be carried out. This will be shown on the D.S.I.R. stand at Harrogate.

Another outdoor exhibit was an experimental chimney built close to the Laboratory buildings. Artificial smoke was produced for the benefit of the visitors who saw how the height of the chimney and the velocity of the flue gases leaving it can be varied. The Laboratory is co-operating with the National Physics Laboratory in an investigation to show how far tests on models in wind tunnels simulate actual conditions, in particular the effect of surrounding buildings on the dispersion of chimney gases. By this type of experimental chimney it is hoped to show how far wind tunnels can be used in chimney design.

INTERNATIONAL SECTION

Norway

NEW AIR POLLUTION LEGISLATION

from Dr. Walter Lindberg

Institute of Hygiene, University of Oslo

A REVISION of the Norwegian Neighbourhood Law, which means a considerable reinforcement of existing ordinances on the abatement of air pollution from industry in Norway, is now completed. According to the new law, which came into force on January 1, 1962, a concession (Royal Permission) is required before industry can build new installations that are likely to emit smoke fumes, gaseous air pollutants or radiation (radioactive substances) in quantities which might produce damage or be a considerable nuisance to many, or within a considerable area. These same ordinances apply also to changes in production programmes of existing industries. Before permission is given, the neighbours must be notified, giving reasonable time for complaints. Permission is granted only on terms which protect those who may sustain loss. The conditions for a revision of former decisions (modification of unnecessary terms, or enforcement of protective measures) are stipulated.

According to the law there will be a permanent expert panel (or council) connected to the Department of Industry, with five members and their deputies appointed by the King for four years. This council on air pollution problems (" Röykskaderådet ") will provide the necessary information for the decisions to be made according to the concession requirements, and it will probably also serve as a central administrative council on air pollution abatement in general, and organize investigations and research in this field. Members of this expert panel have recently been appointed.

Besides this new development, there are also the following ordinances in Norwegian legislation on air pollution abatement:

The Public Health Law authorizes in general terms the city boards of health to prevent any activity (trade, business) from being carried on with undue hazards to the general health of people in the neighbourhood. The corresponding phraseology in the chapter on the responsibilities of the County Boards of Health is even more vague. But the Public Health Law authorizes the Local Boards of Health to make necessary rules and regulations, which must be carefully drafted and sanctioned by the State Welfare Department. A " Norm for county health regulations " has been given in which it is stated that plans for new industrial activities and plans for expansion or changes in production shall be submitted to the Board of Health for approval, and the Board of Health can forbid construction of a plant in a place where sanitary nuisances, or air pollution detrimental to health, are likely to arise. If unnecessary air pollution from an existing plant or industrial activity is hazardous to health, the local Board of Health can order proceedings to be taken against it.

According to *The Housing Law* factories, workshops, stocks and stores with a fire hazard or which may be a nuisance to the neighbours (smoke, dust, odours) must be restricted to an industrial area or district. The local administrative council on housing is authorized to take precautions against undue air pollution from fireplaces and incinerators by smoke, fly ash, etc., and to make conditions on the construction of stacks in large units, like boilers and power plants.

The Law on Motor Vehicles states in general terms that the engine shall be so constructed and adjusted that it does not emit fumes, smell, or make more noise than necessary. Regulations and instructions on the testing of diesel engines, permissible smoke levels, direction of exhaust tube in buses, is now under preparation.

The Netherlands

CLEAN AIR ACT COMING?

from F. P. Brooks

Holland has no Clean Air Act, and although the stage has not yet been reached when such an Act is necessary there are nevertheless indications that some kind of controlling legislation is being considered.

This and other details were given to twenty-four public health inspectors when they visited Rotterdam recently. The inspectors, members of the Eastern Centre of the Association of Public Health Inspectors, were making a five day tour of food factories, industrial areas, housing, camping and caravan sites in and around Rotterdam.

Telling them of the difficulties encountered and the remedial measures taken was Dr. H. de Graaf, Substitute Director of the Food Inspection Department of the Municipality of Rotterdam.

Dr. de Graaf said that the main problem facing the administration was the emission of sulphur oxides, particularly in the new industrial areas where many oil refineries were situated. The crude oil imported from the Middle East was particularly rich in sulphur and considerable quantities of SO_2 were emitted.

Superphosphate and enamelling works also emitted fluorides into the atmosphere, and fluorosis of cattle and fluoride injury to vegetation had been experienced. Remedial precautions included the issue of cakes of aluminium sulphate in cattle feed and advising farmers to buy cattle at least two years old, it having been proved that the greatest danger existed in the young growing animal.

Daily rain gauge and volumetric SO_2 records are maintained and Dr. de Graaf said that the average SO_2 content of the air was 150 microgrammes per cubic metre, and an advisory committee had been set up to mediate between industry and the inspectorate and to advise on difficult problems. It is forecast that increasing advice will be sought from the committee on matters of town planning and the present trend of building tree barriers between industrial and residential communities will be extended.

The Municipality has no control over pollution from private dwellings —most of them are centrally heated— but the Nuisance Act of 1875 gives it power to control danger, damage and nuisance from practically all industrial activities and before installing any new boiler the responsible person must describe the plant to be installed and seek approval under the Act.

Dr. de Graaf said that the certificate of the Inspectorate had to state any necessary measures to prevent smoke and gaseous emissions and if these proved inadequate it was very difficult, once the installation was made, to seek any further improvement.

During the tour of the factories the inspectors had the opportunity of examining many Dutch boiler installations and at the Galak Condensed Milk Co. Ltd., were surprised to see a new oil-fired boiler without any CO_2 recorder fitted. One of the staff explained that this particular boiler was guaranteed so completely automatic that such a recording instrument was " not required ".

France

NEW A.P. STUDY CENTRE

A new organization for the study of air pollution in France is the Interprofessional Technical Centre—*Centre Interprofessionnel Technique d'Etudes de la Pollution Atmosphérique* (C.I.T.E.P.A.).

An extensive programme has been drawn up and is being carried out with the co-operation of a number of research centres and laboratories with the guidance of a consultative scientific council. The programme of studies cover a wide field and includes: the preparation of a glossary of terms used in air pollution and related fields, and comparison with glossaries in foreign languages; the drawing up of a list of recommended units of measurement; and the standardization of methods and techniques for measurement. Other sections planned are for the study of fuels from the pollution viewpoint, and the study of smoke production and of methods for the control of smoke and dust emissions.

The new Centre, the President of which is Professor Lafuma, is associated with the Comité d'Action Technique contre la Pollution Atmosphérique, of which the secretary is M. Henri Perdon of the Institut Français des Combustibles et de l'Energie. (3, rue Henri-Heine, Paris XVI.)

U.S.S.R.

CLEAN AIR IN MOSCOW

In the past few years air pollution in Moscow has been reduced by over two-thirds. More than 1,500 special purifying installations have been installed at industrial and municipal enterprises to combat atmospheric pollution. Hundreds of industrial enterprises have changed to gas fuel, and whole factories are being transferred outside the city boundaries. People living in the areas round industrial enterprises are being moved to other places and the sites vacated are being planted with trees and shrubs. Special stations, scattered over the city note any harmful increase in air pollution. Every year they carry out 15,000 laboratory tests of the atmosphere and make appropriate proposals based on the tests. Moscow's industry is being rapidly switched over to gas fuel and this is substantially reducing pollution of the atmosphere. Only three years ago gas accounted for only $40\frac{1}{2}$ per cent. of the total fuel consumed in Moscow. Last year the figure was 69 per cent.

From the *Consulting Engineer*

U.S.A.

FIELD OPERATIONS MANUAL

The U.S. Public Health Service has issued an A.P. control " Field Operations Manual "—a large and indeed imposing textbook of 285 pages, 12 in. by 9 in. It is devoted entirely to the practical aspects of what is described as a single facet of an effect a.p. control programme—field inspection and enforcement activity. Originally prepared as a training manual for field personnel in the Los Angeles District it has been made available by the Federal Health Service for general distribution.

Every aspect of the work is covered in 14 chapters, which include, for example, " Organization of the Air Pollution Control Agency ", " The Air Pollution Inspector ", " Handling the Citizen Complaint ", " Identifying Effluent Plumes ", " Detecting and Measuring Invisible Contaminants ", and " Collecting and Reporting Evidence ".

Extensively modified to meet U.K. conditions, such a manual might well be of great service in this country.

WHAT CABRILLO SAW

A very different U.S. Public Health Service publication is an illustrated booklet " The Air You Breathe ", which is a reprint of a series of articles on air pollution that appeared in the

Richmond Times-Dispatch, June 4-16, 1961. Author: Hamilton Crockford. Written in a brisk, personalized style, the article is brimming with convincing facts and comments. Here is a picturesque and telling quote:

> Juan Rodriguez Cabrillo never heard of an olefin.
>
> The air was surely marvellously sweet and the sun a shining glory when he surveyed the California coastline in the fall of 1542.
>
> But he got an eyeful.
>
> Near the spot off San Diego where on a long-ago September 28 he first sighted their mainland, Californians established a monument to him—in 1913, the Britannica records. But even then they had no inkling what a prophet he was.
>
> The world was still very young. And, after all, the olefins, while nothing at all like tailfins, were peculiarly kin and scarcely heard of before these.
>
> It was on an October afternoon and farther up the coast from his first look that explorer Rodriguez dropped anchor in today's San Pedro Bay and took what must have been a startled gander inland:
>
> He could see mountain peaks in the distance but he couldn't see their bases.
>
> " Smoke from Indian fires rose perpendicularly into the calm air for a few hundred feet, then spread out over the valley. Impressed by this phenomenon he recorded it in his diary and named the place ' The Bay of Smokes '."
>
> Thus the magazine *Power*, citing historical authority, describes the white man's eyeopener on the area that was to embrace Los Angeles.
>
> " What the Spaniard saw," it says most unromantically, " was the combined effect of a thermal inversion and man-made pollution ".
>
> It was 401 years before Los Angelenos got their real eyeful . . .

U.S.A.

CHICAGO CONFERENCE

The Air Pollution Control Association of America held its annual general meeting in Chicago, at the Hotel Sheraton-Chicago, on May 20 to 24 last. The pattern and scope of the conference is very different from our own N.S.C.A. conference, as is shown by the fact that no less than 89 papers were presented.

We have received both a set of abstracts of these papers, as well as a set of the papers themselves—printed or duplicated individually.

The number of papers makes it difficult to notice or abstract them *in toto*, so we are therefore giving a select list of titles and authors of those likely to be of interest to our British and other readers. (The figures in brackets after each is the A.P.C.A. reference number.)

Development of an Electric-Furnace Dust-Control System. W. W. Campbell and R. W. Fullerton, U.S. Steel Corp. (62.1).

The Use of Adhesive-Coated Paper for Estimating Incinerator Particulate Emissions. C. W. Gruber and C. E. Schumann. Bureau of A.P. Control, Cincinnati. (62.4).

The Calibration of Smoke Density. J. L. Sullivan, N.S.W. Dept., Public Health, Sydney, Australia. (62.7).

Sydney, a Potential Los Angeles of the Southern Hemisphere. *Id.* (62.8)

Measurement of Diesel Engines Emissions. H. C. McKee, J. M. Clark and R. J. Wheeler, South-west Research Inst., San Antonio, Texas. (62.9).

Variations in Air Pollution and the Incidence of Respiratory Disease. F. C. Doran, G. S. Everts, and R. Smith, Philadelphia. (62.11).

Air Pollution Control in Municipal Incineration. J. W. Lenehan, John Wood Co., N.J. (62.14).

Incinerator Standards. E. M. Voelker, Incinerator Inst. of America, New York. (62.24).

Control of Air Pollution from the Burning of Insulated Copper Wire. E. R. Kaiser and J. Tolcias, New York Univ. (62.25).

Continuous Air Monitoring Programme. G. A. Gutze and E. C. Tabor, Robert E. Taft San. Eng. Centre, Cincinnati. (62.26).

The Variation with Height of the Dust Loading over a City as Determined from the Atmospheric Turbidity. R. A. McCormick and D. M. Baulch, Robert E. Taft San. Eng. Centre, Cincinnati. (62.28).

Air Pollution Potential Forecasts—A Year's Experience. M. E. Miller and L. E. Niemeyer, Robert E. Taft San. Eng. Centre, Cincinnati. (62.31).

Relations of Gustiness to Sulphur Dioxide Concentration. D. M. Baulch, Robert E. Taft San. Eng. Centre, Cincinnati. (62.32).

Engineering, Operation and Maintenance of Electrostatic Precipitators on Open Hearth Furnaces. R. L. Schneider, U.S. Steel Corp. (62.35).

The Contribution to Air Pollution by Pigeons. M. M. Braverman, C. Theophil, F. Masciello and C. Smith. City of New York A.P. Control Dept. (62.36).

Diesel Exhaust Composition and Odour Studies. R. H. Linnell and W. E. Scott, Scott Research Lab., Perkasie, Penna. (62.43).

A Test Procedure for Motor Vehicle Emissions. G. C. Hass and M. L. Brubacher, Motor Vehicle Poll. Control Bd., Los Angeles. (62.44).

Automotive Vehicle Exhaust Control by Engine Modification. A. C. Stern, Robert A. Taft San. Eng. Centre, Cincinnati. (62.52).

Programme for the Survey of Lead in Three Urban Communities. D. R. Diggs, H. E. Hesselberg, J. H. Ludwig and J. A. Maga. (62.55).

The Effects of Inhaled Iron Oxide on the Health of Man: (a) Emissions in a Steel Producing City; (b) Effects on Man. (*a*) W. E. Sebesta, Republic Steel Corp., Cleveland; (*b*) G. Wright, St. Luke's Hospital, Cleveland. (62.73).

New Developments—Federal Air Pollution Programme. V. G. MacKenzie. U.S. Public Health Service, Washington. (62·78).

Mortality and Morbidity due to Air Pollution. L. Greenburg, Albert Einstein Coll. Medicine, New York; F. Field, J. I. Reed and C. Erhardt, New York City Dept. of Health. (62.79).

These, and the unlisted papers may be inspected at the Society's library, or photostat copies may be obtained to order.

MORE INTERNATIONAL NEWS

West Germany—The principal German organization concerned with air pollution, the V.D.I. Clean Air Commission, is holding a conference in Stuttgart from October 10 to 12—thus unfortunately clashing with the British conference at Harrogate. The theme of the German meeting is " Life and Clean Air in Industrial Areas ". We hope to report on the conference in a later issue.

Washington, U.S.A.—A National Conference on Air Pollution, organized by the Public Health Service, U.S. Department of Health, Education, and Welfare, is to be held in Washington, D.C., from December 10 to 12. The theme will be " Let's Clear the Air ", and the conference is being called for three major reasons: to explore ways of obtaining broader application of current methods of air pollution control; to stimulate co-operative action by the public, industry, and all levels of government; and to assess the status of current air pollution knowledge.

Control by Helicopter—James V. Fitzpatrick, new city director of air pollution control, tried spotting smoke violations from a helicopter, and then announced he hoped to arrange regular flights for this purpose. Five violations were spotted in a 45 minute flight.

—*Chicago Daily Tribune*

Ireland—The 2nd annual report on the measurement of air pollution in the Republic of Ireland has been issued by the Department of Local Government. There has been a steady but slow increase in the number of recording stations and by the end of the year 14 deposit gauges and 11 lead peroxide instruments were in operation in five separate localities. More about air pollution in the Republic, and new legislation, will be given in a report to the Harrogate Conference by Mr. F. E. Dawson, of the Department.

The South East Division recently visited the British Railways Motive Power Depot at Stratford. The above photographs show the old Jubilee (Steam) shed and the new Diesel shed, in the one case with steam locomotives to the fore, in the other with new diesels predominating

COALITE PROGRESS

The report of the Chairman (Commander Colin Buist, C.V.O.) of Coalite and Chemical Products, for the year ended March 31, 1962, is a cheerful one. After a number of disappointments and a reduction of profits the previous year, the rate of steady progress has been restored. The profit, after depreciation and before taxation, totalled £1,017,558, compared with £852,133 for the previous accounting period.

The Askern Works operated on full load throughout the year. At Bolsover two of the original eight batteries of retorts were modernized and increased in size and the remaining two are now receiving similar attention.

Commander Buist said: " We reported a breakthrough last year in relation to the mechanization of retort operations and in developing means of virtually eliminating the emission of smoke when Coalite is discharged. Good progress has been made in the meantime and benefit is already being derived from improving efficiency and better labour productivity. The heating of all retorts at both Askern and Bolsover is now automatically controlled. Apart from the provision of completely mechanized changing and discharging machines, which will take somewhat longer to install throughout, it is expected that the programme will be completed by the end of March 1963."

BRITAIN'S ELECTRICITY

Convention at Brighton

The 14th British Electrical Power Convention, in the Dome, Brighton, in June, was big in numbers and representative of all electrical interests.

It was opened by the President, Sir William McFadzean, whose address was on " The British Electrical Industry in the World Scene "—which was also the theme of other papers presented.

" It was the genius of British scientists and engineers that first made possible the use of electricity," said Sir William.

" They gave," he continued, " the world the first steam turbine, the electric lamp, the thermionic valve, radar, television and innumerable other discoveries in the field of electric power. They made possible the atomic age and were the first to develop its peaceful purpose in the generation of electrical energy.

" Today, the British electrical industry covers an immense range, comparable to any similar industry in the world. It is in the forefront of progress in plant, equipment and technique for the mass production and distribution of electric power, for the development of electric traction, in the field of communications both in this planet and in outer space, in medical science and a host of other applications in the rapidly advancing world of electronics, and finally, in the home where the production of an endless variety of domestic electrical appliances has lessened the burden of the housewife in such a revolutionary manner."

The annual output of the industry had grown from £150 million in 1937 to more than £1,600 million in 1961, and the export contribution from £19 million to £310 million in the same period.

Sir William said that on a world basis, the dramatic increase in the use of electricity showed no sign of diminution. It had magnified 16 times during the last 35 years, and the known installed generating capacity had reached a total in excess of 460 million kilowatts by 1960.

The highly industrialized nations—with the highest per capita income—including those of U.S.A., Canada, the United Kingdom, Western Europe, Japan and Australia—collectively possessed 78 per cent. of the world's electrical capacity but contained only 21 per cent. of the world's population. At the other end they found India and Africa possessing only 2·8 per cent. of the generating capacity but with 24 per cent. of the world population, the majority of whom were still living on the edge of subsistence.

Coal the Principal Fuel

" Planning for Extension in Electricity Supply " was the title of a paper by R. S. Edwards (Chairman of the Electricity Council) and D. Clark (Chief Planning Engineer, C.E.G.B.).

" If we are anywhere near right in our fuel forecast for 1970, then coal is likely to remain the principal fuel for electricity generation for a long time, and its efficient deployment, having regard to its availability and cost at the different coalfields, is of prime importance to the economy of electricity supply."

Mr. Edwards and Mr. Clark stated that the use of the different fuels in the power stations of England and Wales in the years 1950/51 and 1960/61 along with a forecast for the year 1970/71, were as follows:

	Million Tons Coal Equivalent		
	1950/1	1960/1	1970/1
Coal and Coke ..	31·2	48·9	72·0
Oil	0·2	9·2	10·5
Nuclear	nil	nil	15·5
Total ..	31·4	58·1	98·0

The assumed nuclear contribution corresponded to a capacity of 6,000 megawatts out of a total generating capacity of about 60,000 megawatts.

The contribution of oil in 1970 was particularly uncertain because a single new station could significantly alter so small a total and because availability and price could be affected by international factors and by taxation. This proportion of imported fuel could hardly be deemed to exceed the prudent fraction in view of the greater dependence of other sectors of the economy on petroleum products.

The planning flexibility still remaining for 1970 lay in the choice of fuel and location of the new stations that would be brought into service to meet load growth in 1967, 1968 and 1969, the earlier construction programmes being already in hand. Once built they would consume fuel until the end of the century.

Dual-Fired Plant

Although in this country we were accustomed to single-fuel power stations in a single-fuel industry, we now required to consider the extent to which in a three-fuel industry we should provide somewhat more costly dual-fired plant, equipped to burn either oil or coal at short notice, so that the frontier between coal and oil could readily be varied as the future unfolds.

When planning new power stations it was easy to look around and see where coal was available cheaply today, but the real question was in which coalfields were the reserves and the potential for low-cost production such as would make supplies plentiful and cheap in the future. The East Midlands and Yorkshire (N.C.B. North-Eastern Division) coalfields from which by far the biggest supplies of power station coal were planned to be drawn in the future, were not only the biggest suppliers of electricity coal at the present time but were the two coalfields yielding profits. This reflected the fact that in those fields there were large reserves suited to efficient mechanised production and in the case of the East Midlands they were of qualities that were not sought after by many other users but which could be burnt efficiently in power station boilers designed specifically for the purpose.

The Coal Board were looking to these coalfields to carry the whole interest charges of their industry in the immediate future. Was not the planning of power stations to enable increasing quantities of these coals to be produced cheaply and used efficiently a piece of sound business for the electricity industry, for the coal industry and for other consumers of coal?

The construction of very large and efficient stations in economic locations was the cornerstone of their policy. The new 2,000 megawatts stations would each require a coal supply rising from zero to five million tons per annum in the short span of three years and the problems of assimilating such a large increment at one point in any coalfield and transport network called for consultation at the planning stage.

The extensive railway network, especially in the coalfield areas, was well adapted to providing the connecting links. It was advisable to keep new power stations clear of the most heavily-occupied main lines, and try, in consultation with British Railways, to site them where little new work was required on the railway network. Some of the largest new power stations in the East Midlands and West Riding of Yorkshire would make effective use of branch lines that would otherwise have been uneconomic because of declining traffic. On an average working day the fuelling of a 2,000 megawatts power station called for 20 of the heaviest coal trains that the railways could handle and the corresponding returning empties. For those power stations a once-through unloading system was being developed, in which wagon time on site would be only an hour.

Questions in Parliament

CEMENT DUST, NORTH-WEST KENT

Mr. Dodds asked the Minister of Housing and Local Government and Minister for Welsh Affairs how many visits in connection with the cement dust nuisance have been made to the North-West Kent area by alkali inspectors since January 1, 1962, between the hours of 10 a.m. and 4 p.m. and between 5 p.m. and 9 a.m. respectively.

Mr. Corfield: Information in exactly this form is not available. This year 26 visits, including four by the Chief Alkali Inspector, have been paid to individual cement works in North-West Kent between 9 a.m. and 6 p.m. No visits have been paid between 6 p.m. and 9 a.m.

Mr. Dodds asked the Minister of Housing and Local Government and Minister for Welsh Affairs, in view of the widespread anxiety in North-West Kent at the worsening nuisance of cement dust, what action he now proposes to take to protect the public.

Mr. Corfield: Clay with a high alkali content has recently been interfering with the operation of the precipitators at cement works in North-West Kent. The company concerned is making arrangements to obtain clay free from this defect, and meanwhile emergency measures to reduce dust emission have been taken. The Chief Alkali Inspector is discussing urgently with the industry further long-term improvements.

MOISTURE IN SMOKELESS FUELS

Mr. Shepherd (26.6.62), asked the President of the Board of Trade if he will introduce legislation to protect the consumer from short weight in smokeless fuels due to undersizing and excessive moisture, as recommended by the Consumer Advisory Council of the British Standards Institution.

Mr. N. Macpherson: My right hon. Friend is bearing this matter in mind in connection with the weights and measures legislation which the Government intend to introduce as soon as Parliamentary time permits.

Mr. Shepherd: In view of the fact that these moisture contents are extremely high and cause a serious loss to the consumer, is there anything which my hon. Friend's Department can do, in conjunction with the Ministry of Power, to put an end to this abuse?

Mr. Macpherson: My information is that the moisture contents are not particularly high. The B.S.I. specification for open fire gas coke is between 9 per cent. and 12 per cent. at the point of production. When complaints have been made it has been generally found that that percentage has not been exceeded.

Mr. Darling: In view of the fact that we are never likely to get any weights and measures legislation from this Government, will the Minister bear in mind that what is needed here are standards, designations and specifications, which would hardly come within the provisions of weights and measures legislation, but which should come under his Department?

Mr. Macpherson: The hon. Member is quite right, in that part of this subject deals with quality rather than quantity, but I do not accept his premise.

Mr. Gresham Cooke: Although B.S.I. specifications are laid down at the point of production, is it not true that this coke can sometimes lie about in merchants' yards and absorb a large quantity of moisture so that at the point of sale, it has a moisture content very much higher than the 12 per cent. mentioned in the B.S.I. standard?

Mr. Macpherson: I am informed that once it has been quenched at the works coke absorbs substantial amounts of water only when it is stored in small quantities, and particularly when it is exposed to rain or snow. [*Laughter.*] I get this information from my right hon. Friend the Minister of Power. A provision was contained in the Weights and Measures Bill making it an offence for anyone to damp solid fuel with intent to deceive or defraud. It would be an extremely expensive business to provide covered protection for all solid fuels stored outside.

Mrs. Slater: After that very profound statement, would not the hon. Member also bear in mind the fact that more and more local authorities are introducing smokeless zones and that, therefore, more and more people have to buy smokeless fuels? The cost of these fuels is already high. Is it not therefore essential that when people buy them they should at least know what weights they are buying? Should not the Government do something urgently at least to deal with this aspect of weights and measures legislation rather than to keep fobbing us off with a statement that we may have a Weights and Measures Bill this year, next year, some time, never?

Mr. Macpherson: We have to have regard to what is practical both as regards time and as regards the possible content of legislation.

Mr. Callaghan: Cannot the Minister go further? Has he not read the report which was circulated to all hon. Members last week on this subject showing the great variety in the value which the consumer gets for what he purchases? Has he no remedy when the moisture content might deprive him of between 10 per cent. and 20 per cent. of what he has paid for? Cannot the Government take action in advance of their ill-fated Weights and Measures Bill?

Mr. Macpherson: It is not true to say that the consumer has no protection in any part of the country. There are a number of local Acts which cover the matter on the lines of the provision which was included in the Weights and Measures Bill.

Coal facts and figures

New N.C.B. Report

National Coal Board, Report and Accounts for 1961. H.M.S.O.
3s. 6d. net

Production

As was planned, slightly less coal was mined in 1961 than during the previous year, 179 million tons deep-mined, 8·53 million tons open-cast and 2·34 million tons from licensed mines, making a total of 190·46 million tons, which enabled the Board to dispose of 7¾ million tons of stocked coal. Inland coal consumption amounted to 191·8 million tons and export to 5·7 million tons. The largest consumers were: power stations 54·7, gasworks 22·2, coke ovens 26·8, industrial consumers 29·2 and domestic consumers 28·3 million tons.

Manpower was reduced by some 22,000 leaving 560,000 in employment at the end of the year.

Finance

The Board's collieries made an operating profit of £22·2 million and open-cast £6·7 million. After payment of interest charges of £42·4 million the Board's deficit for the year was £15 million compared with £21·3 million in 1960. Capital expenditure during the year amounted to £93·4 million of which £47·2 million was on major colliery schemes and £36 million on other colliery expenditure. During the year certain selective price increases were imposed mainly on large coal with smaller increases on other coal.

Reconstruction

The Board is concentrating on collieries with high efficiency and in these on faces capable of high daily output. 270 more power-loading machines were brought into use making a total of 1,535. Mechanized pithead outputs amounted to 48·4 per cent. of the deep-mined output. The saleable output per manshift amounted to 28·9 cwt. overall or 83·5 cwt. at the coal face. Considerable progress has been made in the installation of power-advanced roof supports.

Attendance

During the year absence amounted to 17·28 per cent. among face workers and 15·40 per cent. for all workers.

Just over two million tons of coal was lost through unofficial stoppages mainly in the Scottish, North-Eastern and South-Western Divisions.

Carbonization and Coal Processing

The Board sold 4·89 million tons of coke during the year, 390,000 tons less than in 1960, due mainly to reduction in demand from blast furnaces, and stocks increased by 70,000 tons to 5·16 million tons. In order to reduce coke production, the Board have closed many old plants and reduced production at others; but in this respect they are restricted by long-term contracts to supply coke oven gas to Area Gas Boards. To meet this difficulty schemes for the production of producer gas from coke for underfiring, use of methane drained from collieries for underfiring have been employed. An experimental Ruhrgas slagging gasifier at Manvers Main will enable coke oven gas at present used for underfiring to be sold to Gas Boards.

With growing demand for solid fuel central heating and improvements in design of grates and appliances for burning " Sunbrite " coke, the Board expects this market for this smokeless fuel to expand. It is readily available and during the year the Board sold 2,300,000 tons of this and other cokes, 711,000 tons of " Phurnacite ", 114,000 tons of " Warmco " and 673,000 tons of Briquettes and Ovoids during the year.

Efforts continue in the development of new types of smokeless fuel from high volatile coal, for treating coal and pitch briquettes to make them smokeless, and in other directions.

By-products

During the year the Board produced 56,000 million cubic feet of coke oven gas, 341,000 tons of crude tar, 21 million gallons of crude benzole, 59,000 tons of sulphate of ammonia and 13,000 tons of other ammonia products.

Brickmaking

The Board are the second largest makers of bricks in the country and operate 62 brick, salt-glazed pipe and refractory works. In 1961 they produced 509 million building bricks.

—A.J.C.

Sulphur Removal from Flue Gases

The removal of sulphur from flue gases is one of the most intractable of air pollution prevention problems, and the following abstract of a paper by F. Johswich (*BWK*, *Vol.* 14, *No.* 3, *pp.* 105-115, 1962) appeared in *British Power Engineering*, August, 1962, and is concerned with a line of research that may be of considerable importance in large-scale fuel-burning operations.

The problem of removing sulphur from coal and oxides of sulphur from flue gases has been studied for many years, but so far no practical solution has been found. In the case of oil firing the use of additives has reduced the effect of sulphur in the boiler but not the amount of sulphur in the flue gas. Several methods of washing flue gases have been proposed and tried out (Fulham-Simon Carves, Grillo, Lurgi-Sulfidin, Johnston-Singh) and dry absorption methods have been studied on a laboratory scale, but the few that proved technically successful were so expensive that they could not be applied on a large scale. Recent development work by Reinluft (Clean Air) GmbH in Essen sponsored by the Volkswagenwerk AG has shown that the use of activated carbon would, contrary to earlier opinion, lead to a method which would be both practical and economic.

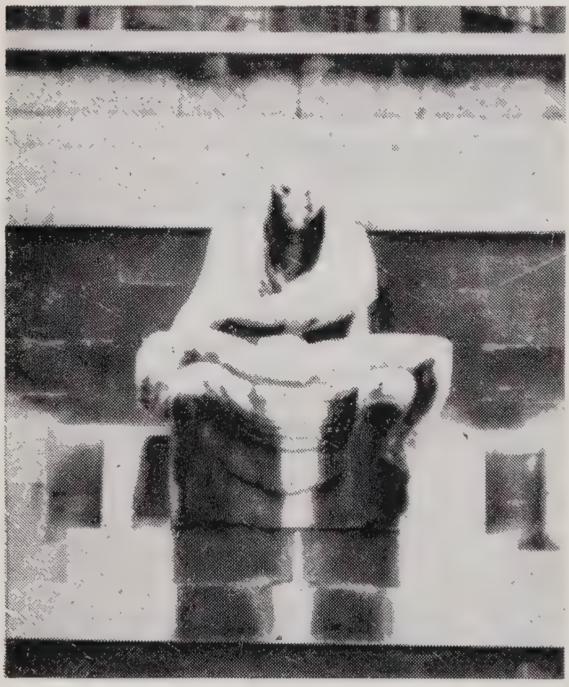
The process is based on the fact that SO_2 adsorbed by activated carbon is almost completely present as H_2SO_4 and can only be desorbed at temperatures between 660 and 750 deg.F. (349 and 399 deg.C.) when the H_2SO_4

decomposes into water vapour and SO_2. The starting point is semi coke, which is automatically activated by its adsorption of SO_2. Flue gases cooled to about 400 deg.F. (204 deg.C.) pass through the lower part of the adsorber where SO_3 and H_2SO_4 vapours are removed, are then cooled by heat exchange with air to about 212 deg.F. (100 deg.C.), pumped up the upper part of the adsorber where 99·9 per cent. of the sulphur is removed. Simultaneously the activated carbon moves down under its own weight into the desorber; part of the desorbed SO_2 is recirculated, after having been heated by an external source to 750 deg.F. (399 deg.C.), through the desorber to heat the activated carbon to its desorption temperature; the excess SO_2 is removed from the circuit, the regenerated activated carbon continuously returned to the top of the adsorber.

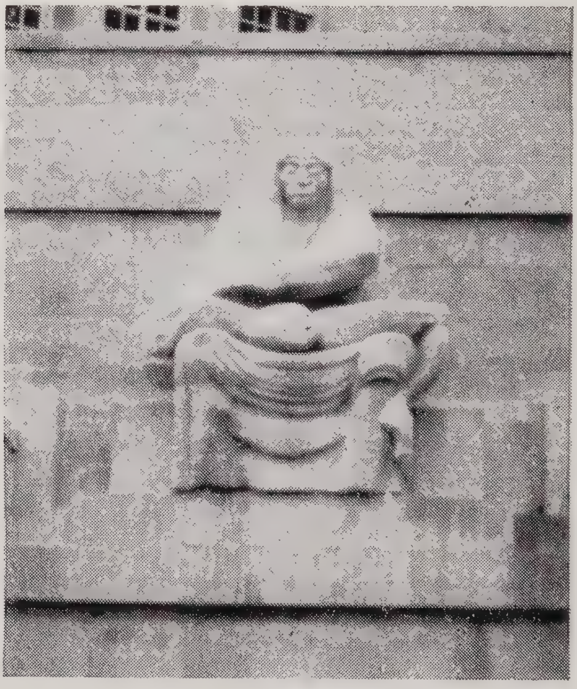
Calculations have shown that if used on a large scale the additional cost per kWh would be a very small fraction of the total generating costs. This new method is at present being studied at the Warren Spring Laboratories of the D.S.I.R. and preliminary results have confirmed the German claims.

L.T. CLEAN UP

London Transport's building at St James's Park Station, above, has just been cleaned. This robs us of a telling propaganda photograph of Epstein's "Night", previously grotesquely streaked with black, and now restored to its pristine cleanliness. See contrasting photographs below. (Smokeless Air photographs)



"Night" before



and "Night" After

THE CLEAN AIR COUNCIL

In addition to the re-appointment of members whose term had expired, the following new members have been appointed by the Minister of Housing and Local Government to the Clean Air Council:

Mr. S. C. Ginn, Chief Executive, National Industrial Fuel Efficiency Service.

Mr. R. A. Hacking, O.O.E., Director of Research, Richard Thomas & Baldwins Ltd.

Mr. G. Nonhebel, Fuel Adviser to I.C.I. Ltd.

Mr. J. T. Turner, Chairman of the Vehicles' Committee, National Road Transport Federation.

Mr. Hacking and Mr. Nonhebel are members of the N.S.C.A. Executive Council.

CHRONIC BRONCHITIS CONFERENCE

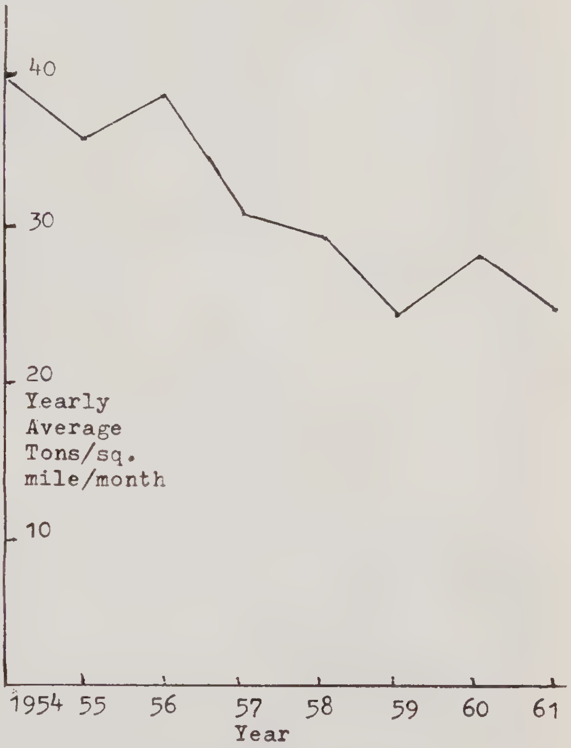
The Chest and Heart Association announces a conference on " First Aid in Bronchitis " to be held in the Livery Hall, Guildhall, London, E.C.2, on Wednesday, October 17, (10 a.m. to 4.45 p.m.). Ten short addresses will be given including one on " The Value and Limitations of Bronchitis ", by Dr. Llywelyn Roberts, M.O.H., Sheffield. The Chairman will be Mr. Stanley E. Cohen, Chairman, Port and City of London Health Committee, and Hon. Treasurer, N.S.C.A.

The fee will be one guinea and a programme, with registration form, may be obtained from the Association at Tavistock House North, Tavistock Square, W.C.1.

The Association is also holding a symposium on Chronic Bronchitis, for doctors, on November 7, at Manson House, Portland Place, W.1, the fee for which is two guineas.

Cleaner Air in Sheffield

The annual report, for 1961, of the Sheffield and District Clean Air Committee—the only joint statutory committee—again shows steady improvements in the area. The number of smoking chimneys brought to the attention of the committee fell from 182 in 1958 to 141 in 1961, while the number of exemptions under S.2 of the Clean Air Act fell from 28 to 8 in the same years. Perhaps the most encouraging sign of all is the steady fall in deposits, as shown by the accompanying diagram, for Attercliffe:–



NEWS OF GAS

An 11,000 cubic feet per hour air blast burner which is fully automatic in operation has been developed at the Midlands Research Station of the Gas Council. Town gas at atmospheric pressure is entrained by a stream of air supplied to the injector at a pressure of about 30 in. w.g. The air-gas mixture is burned in a refractory combustion chamber or tunnel. The burner has a maximum gas rate of 11,000 cubic feet per hour, *i.e.*, five million Btu or 50 therms per hour, which provides a combustion intensity of 20 million Btu. per hour per cubic foot of tunnel. The West Midlands Gas Board announces a unique service to customers—a modern, spacious, heat-treatment shop at Adderley Street, Birmingham, with a secondary establishment at Coventry, where the metallurgical staff of the department is available to give expert advice to customers on problems connected with the heat processing of metals and alloys.

NEWS FROM THE DIVISIONS

Mr Nabarro in Cardiff

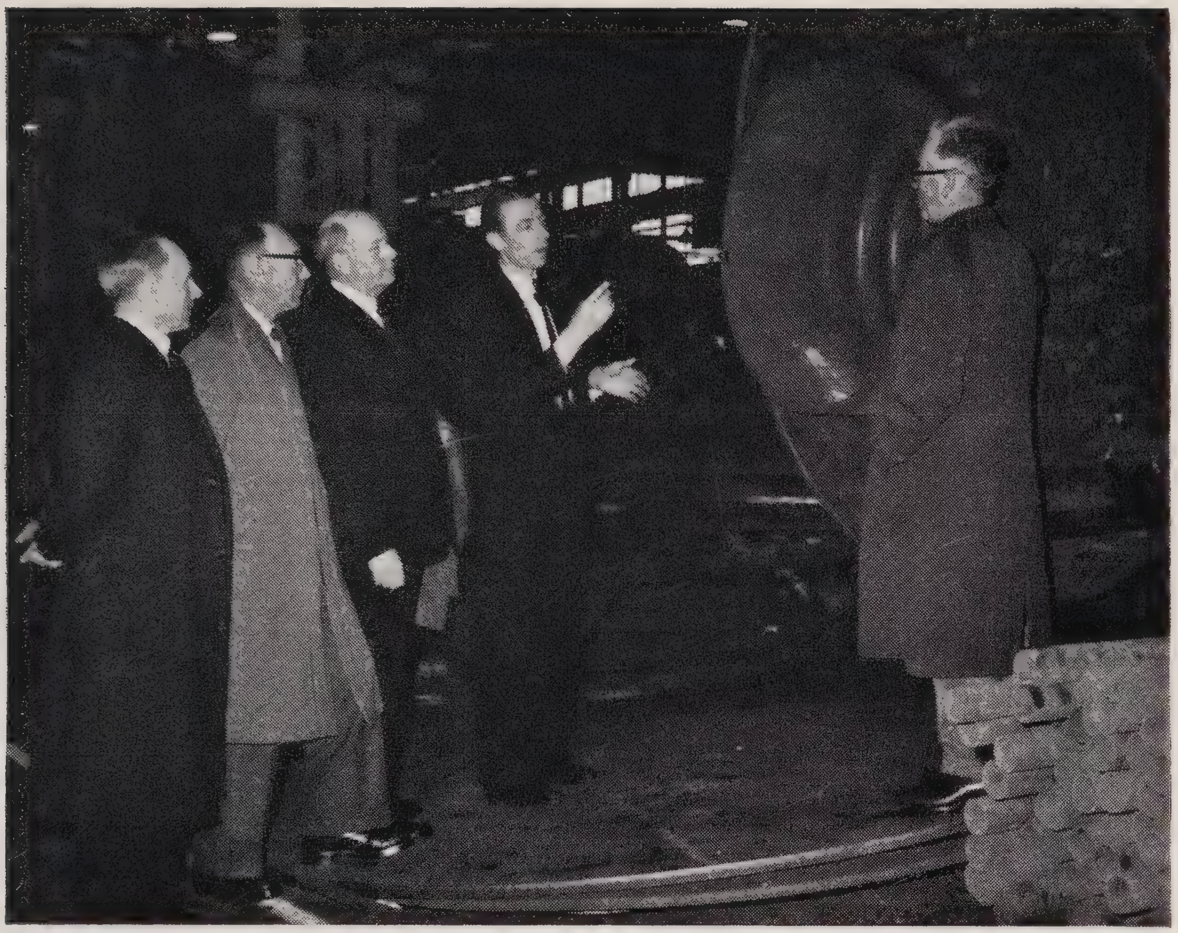
The **South Wales and Monmouthshire Division** of the Society organized a clean air exhibition in Cardiff in May—the first to be held in South Wales. It was staged in the foyer at Thomson House and although not large in scale was well designed and effective.

The exhibition was opened on May 25, by Mr. Gerald Nabarro, M.P., who made what the *Western Mail* called a hard-hitting speech. Local authorities in South Wales, he said, could not contract out of the national clean air policy, and he pointed out that with the exception of Newport there were no smoke control areas anywhere in South Wales.

" In the interests of good health and the avoidance of waste, clean air is something all civic representatives should endeavour to promote ", said Mr. Nabarro, and as an example that South Wales was not as free from smoke as some imagined, he cited the Splott area of Cardiff.

In conjunction with the exhibition was a show of clean air pictures and posters by Cardiff school-children. The Division was supported in its organization of the exhibition by the South Wales Gas and Electricity Boards, the National Coal Board, the Solid Smokeless Fuels Federation, and, of course, Thomson Newspapers Ltd. for the facilities provided.

Mr. Gerald Nabarro, M.P., with the Lord Mayor of Cardiff, Mr. E. Pearce, at the Exhibition organized by the South Wales and Monmouthshire Division. Extreme right is Alderman Dr. C. A. Bence, Lord Mayor Elect, and Chairman of the Division



Members of the Yorkshire Division during a recent visit to the Leeds works of John Thompson (Triumph Stoker) Ltd. Left to right are Alderman Boston of Wakefield, Mr. Myers, C.P.H.I., Bradford, Mr. Saword, P.P.H.I., Hull (Chairman of the Divisional Council), a member of the firm, and Mr. Goodfellow, Divisional Hon. Secretary

On July 5, the **East Midlands Division** visited and held a meeting at the " Coalite " works at Bolsover. Members had a conducted tour of the carbonization plant, the refinery and the laboratories. At lunch, in Chesterfield, by invitation of the Company, they were welcomed by Mr. Francis L. Waring, Deputy Chairman and Managing Director, and by Mr. Councillor J. W. Savage, Chairman of the Bolsover U.D.C.

* * *

The eighth annual general meeting of the **South East Division** was held in London on July 17, and afterwards Mr. Partington of the Electrical Development Association and Dr. Eaton of the Gas Council addressed the meeting on " Problems in providing speedy supply services in smoke control areas. Each speaker reviewed the position in his respective industry and there were numerous questions and a lively discussion.

* * *

The **North West Division** is to hold a special meeting in Bolton Town Hall on October 31. Representatives of local authorities in the north west, together with their M.P.s, are being invited, and the meeting will also be open to the public. The principal speaker will be Mr. P. D. Coates, of the Ministry of Housing and Local Government, who will speak on smoke control area problems and will also answer questions.

* * *

Target Politician—Articles on clean air have recently been published in *Socialist Commentary*, by Mr. Keith Mason, a member of the Society, and in *Liberal News*, by Mr. Roy J. Sharp, N.S.C.A. Administrative Secretary.

SMOKE CONTROL AREAS

Progress Report

POSITION TO JULY 1, 1962—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation . .	44	1
Acres, 3,400		
Premises, 41,060		
Smoke Control Areas in Operation	644	21
Acres, 124,841		
Premises, 690,184		
Smoke Control Orders—		
Confirmed	300	11
Submitted	82	4
Grand Totals	1,070	37

The lists given below are supplementary to the information in the last issue of *Smokeless Air* (Summer, 1962), which gives the position up to March 31, 1962. They now show the changes and additions to July 1, 1962.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Areas in Operation

Aireborough U.D. No. 9, Aldridge U.D. No. 4, Altrincham B. Nos. 4 and 5, Ashton-under-Lyne B. No. 4, *Barnes B. No. 2, Barnsley C.B. No. 3, Bebington B. No. 2, Bingley U.D. Nos. 1 and 2, Birkenhead B. No. 1, Birmingham C.B. Nos. 21 to 33, 39 to 47, 51 and 52, *Bradford C.B. No. 2, Brighouse B. Nos. 3 to 5, *Chesterfield B. No. 2, Denton U.D. No. 5, Derby C.B. No. 1, Dukinfield B. Nos. 2 and 3, Ealing B. No. 6, Finsbury M.B. No. 1, Greenwich M.B. No. 2, Hayes and Harlington U.D. No. 16, *Hindley U.D., Hornchurch U.D. No. 3, Huyton-with-Roby U.D. No. 2, *Keighley B. No. 1, Kirkby U.D. Nos. 1 and 2, Leeds C.B. Nos 2 and 6 to 19, Lewisham M B No. 8, Manchester C.B. No. 4, Middleton B. Nos. 7 and 8, Morley B. Nos. 8 and 9, 11 and 12, Nuneaton B. No. 2, Oldbury B. No. 1, Old Fletton U.D. No. 3, Oldham C.B. No. 3, Preston C.B. No. 5, Pudsey B. No. 1, Queensbury and Shelf U.D. No. 1, Radcliffe B. No. 1, Sale B. No. 2, Scunthorpe B. No. 2, Sedgley U.D. Nos. 3 to 6, Sheffield C.B. No. 7, Southall B. No. 3, Spenborough B. No. 2, Stalybridge B. No. 1, Thornaby-on-Tees B. No. 1, Wakefield C.B. No. 2, Wallasey C.B. No. 5, Wallsend B. No. 1, Walthamstow B. No. 2, Wednesbury B. No. 1, West Bromwich C.B. Nos. 7 and 9, Wigan C.B. No. 1, Yiewsley and West Drayton U.D. No. 3.

New Orders Confirmed but not yet in Operation

Atherton U.D. No. 1, *Audenshaw U.D. No. 2, Barnes B. No. 3, Beddington and

Wallington B. No. 3, Bethnal Green M.B. No. 3, Bingley U.D. No. 3, Birkenhead C.B. No. 2, Birmingham C.B. Nos. 10, 61 and 62, Blaby R.D. No. 1, Bolton C.B. No. 19, Bootle C.B. No. 4, Brighouse B. No. 7, Bromley B. No. 4, Camberwell M.B. No. 3, Cheadle and Gatley U.D. Nos. 2 to 4, Chelsea M.B. No. 2, Chesterfield B. No. 3, Chesterfield R.D. No. 3, Chingford B. No. 2, Church U.D. No. 3, Crompton U.D. No. 2, Dartford B. No. 3, Ealing B. Nos. 8 and 9, Eccles B. No. 4, Elstree R.D. No. 2, Enfield B. No. 3, Erith B. No. 1, Gateshead C.B. No. 4, Gillingham B. No. 1, Halesowen B. Nos. 5 to 12, Hampstead B. No. 4, Harrow B. No. 3, Hayes and Harlington U.D. No. 19, Hemel Hempstead B. Nos. 1 and 2, Heston and Isleworth B. No. 5, Holborn M.B. No. 6, Hornchurch U.D. No. 4, Ilford B. No. 2, Islington M.B. Nos. 7 and 8, Lambeth M.B. Nos. 4 and 5, Luton B. No. 2, Merton and Morden U.D. No. 3, Morley B. Nos. 10, 13 to 18, Newcastle-on-Tyne C.B. Nos. 5 and 6, Oldham C.B. No. 4, Ossett B. Nos. 2 and 3, Poplar M.B. No. 14, Prescott U.D. No. 2, Prestwich B. No. 5, Radcliffe B. No. 2, Rochester B. No. 1, Shipley U.D. No. 2, Slough B. No. 3, Solihull B. No. 2, Southall B. No. 4, Southwark M.B. No. 2, Staines U.D. No. 3, Stoke Newington M.B. No. 9, *Thurrock U.D. No. 1, Warrington C.B. No. 5, Watford B. Nos. 1 and 2, Wednesfield U.D. No. 4, West Bromwich C.B. No. 8, Westminster M.B. No. 9, Whitefield U.D. No. 4, Wigan C.B. No. 2, Willenhall U.D. No. 11, Wilmslow U.D. Nos. 6, 8 to 10, Winsford U.D. No. 2, Yiewsley and West Drayton U.D. No. 4.

New Orders Submitted for Confirmation but not yet Confirmed

Aireborough U.D. No. 11, Bolsover U.D. No. 1, Bradford C.B. No. 4, Brentford and Chiswick B. No. 3, Burnley C.B. Nos. 2 and 3, Chatham B. No. 2, Ealing B. Nos. 10 and 11, Ellesmere Port B. No. 5, Finsbury M.B. No. 3, Glenford Brigg R.D. No. 1, Hackney M.B. No. 5, Halesowen B. Nos. 13 and 14, Hammersmith M.B. No. 4, Heckmondwike U.D. No. 3, Hendon B. No. 4, Horsforth U.D. Nos. 9 to 13, 15 and 16, Irlam U.D. No. 2, Knottingley U.D. No. 4, Lambeth M.B. No. 2, Leeds C.B. Nos. 20 to 22, Leyton B. No. 3, Liverpool C.B. No. 14, Malden and Coombe B. No. 3, Newcastle-under-Lyme B. No. 2, Northfleet U.D. No. 2, Padiham U.D. Nos. 3 and 4, Prescott U.D. No. 3, Salford C.B. No. 9, Scunthorpe B. No. 3, Smethwick C.B. No. 5, Solihull B. No. 3, Southgate B. No. 3, Twickenham B. No. 2, Wakefield C.B. No. 5, Walthamstow B. No. 4.

SCOTLAND

New Smoke Control Orders in Operation

*Edinburgh (Sighthill No. 4).

*Glasgow (Pollokshields and Pollokshields No. 2).

Motherwell (Forgewood).

New Orders Confirmed but not yet in Operation

Dundee (West End), Edinburgh (Sighthill No. 3), Falkirk Nos. 1 and 2, Glasgow (Provan), Kilmarnock No. 1, Stirling County (Stenhousemuir No. 1).

CLEAN AIR YEAR BOOK 1926-63

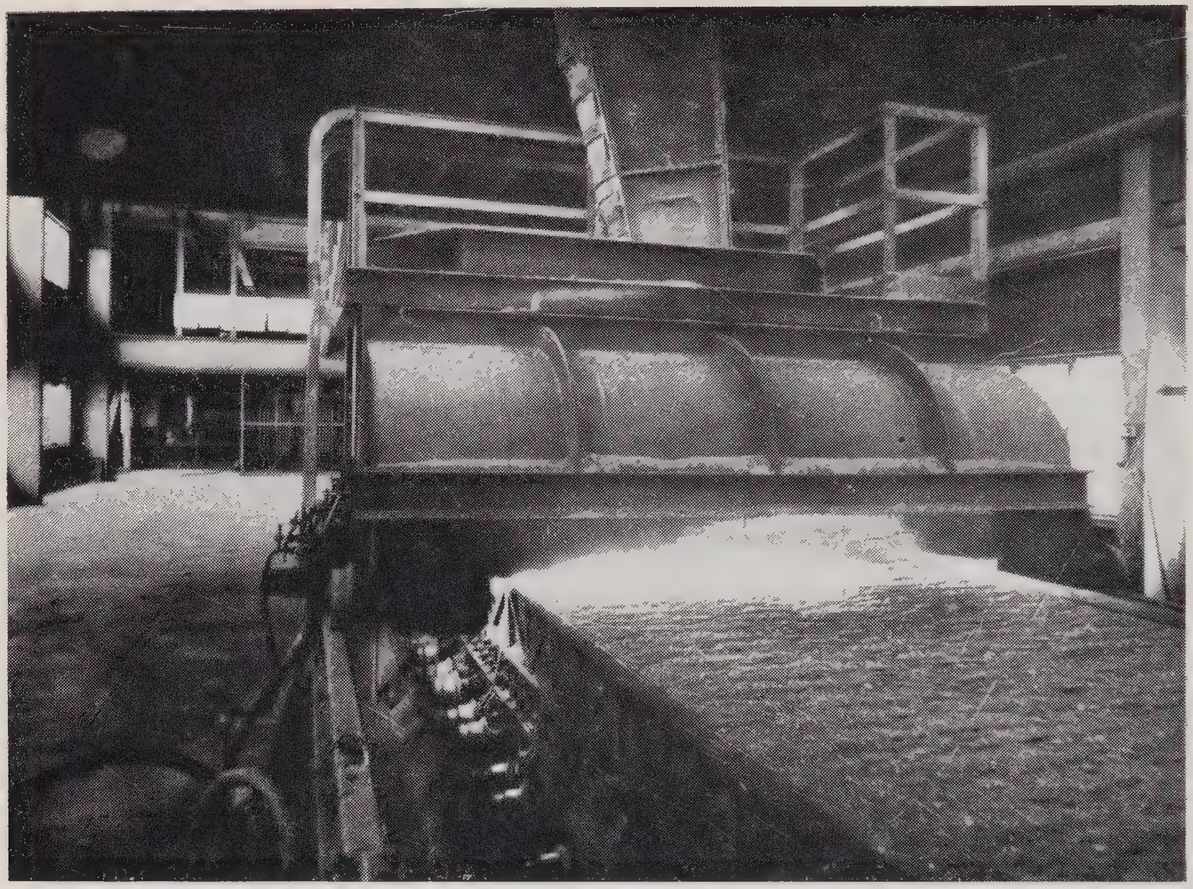
Corrections to Smoke Control Area List

	Target Date	*Final Acreage*	*Acreage 1.1.62*
Connah's Quay (Flintshire) (*omitted from list*)	—	—	56
Chesterfield R.D.C.	1972	29,000	nil
Hayes and Harlington U.D.C. ..	1966	5,159	3,452

NOTICE

The inclusion of an advertisement in any of the Society's publications, including the Trade Directory in the Clean Air Year Book, carries no implication that, because of its inclusion, any appliance mentioned is eligible for grant under the smoke control area procedure.

Appliances that are so eligible must be included in the lists of approved appliances specified in the Memorandum on Smoke Control Areas of the Ministry of Housing and Local Government.



The Oil-fired Ignition Hood

OIL-FIRED SINTER PLANT

A new sinter plant is now in operation at the works of the Skinningrove Iron Co. Ltd. at Carlin How, Yorkshire. The project is part of a development scheme costing, together with ore crushing and screening plant, etc., about three-quarters of a million pounds. The main contractors for the sinter plant were Head Wrightson Iron & Steel Works Engineering Ltd., a subsidiary of Head Wrightson & Co. Ltd. The plant is designed to produce up to about 7,000 tons of self-fluxing sinter per week, the initial requirement however being about 4,000 tons.

Two novel features of the plant are the firing of the coke breeze in the sinter mix by oil instead of the normal mixture of blast furnace and coke oven gas. This has proved very successful. The other novel feature is the installation for the first time in Great Britain of an electrostatic precipitator to clean the exhaust gases from the sinter strand. This unit was installed to ensure that the plant should comply with the requirements of the Clean Air Act.

The object of installing a new sinter plant is mainly to improve the efficiency of blast furnace operations rather than to increase output. Owing to the enormously increased proportion of fines in both home and foreign ores since the end of the war, it has been found impossible to operate a modern furnace at the rate required without producing excessive quantities of flue dust which entails loss of yield and high coke consumption. The complete preparation of the burden and the sintering of all the fines has reduced coke consumption by approximately 4 cwts. per ton and significantly improved the yield, the production of flue dust being practically eliminated. It has also resulted in a much better and more consistent quality of basic iron which has reduced the cost of steelmaking.

Winegrowers' move

M. Bidau, President of the Federation des Syndicats Viticoles, of Bearn, near Toulouse, has announced that the winegrowers of the region are to take legal action against the Société Nationale des Petroles d'Aquitaine. They allege their land has been affected by harmful " fall out " of sulphurous emissions from the company's natural gas and sulphur works at Lacq.

All set for Harrogate Exhibition

The 1962 Clean Air, Fuel Efficiency and Domestic Heating Exhibition, which is being held in conjunction with the Annual Conference of the National Society for Clean Air from October 10 to 12, in the Exhibition Hall, Harrogate, is the largest ever staged by the Society. Over 40 exhibitors will be occupying more than 60 stands which together cover some 20,000 sq. ft. of floor space.

The Exhibition will be opened from 9.30 each morning until 6.30 on the first day, Wednesday, October 10, 5.30 on the second day, the 11th, and until 1.00 p.m. on Friday the 12th. Admission to the Exhibition is by invitation and tickets are available from any of the exhibitors or on application to the National Society for Clean Air.

This will be the fifth National Exhibition staged by the Society in conjunction with its annual conference. The first was put on at Llandudno in 1958 and comprised 24 stands arranged around the balcony of the Pier Pavilion. The exhibition had to close during the conference sessions as these were held in the same hall.

1959 was the Diamond Jubilee of the Society and to mark the occasion, an International Conference and Exhibition was held at the Seymour Hall, London. The Exhibition occupied two small halls adjoining the Conference Room with a total of 31 exhibitors.

The following year, Harrogate's new Exhibition Hall was utilized to the full and a most successful exhibition attracted 49 exhibitors.

In 1961, the Conference and Exhibition moved to Brighton and was staged partly in the Corn Exchange and partly under canvas. There were 40 exhibitors.

All aspects of air pollution will be covered by the exhibition—from smoke and grit to diesel and chemical fumes, all forms of smokeless heating for home and industry, dust extraction, air filtration, smokeless incineration, fuel efficiency and economy, plant and equipment, etc.

New Clean Air Film

The film " Clean Air ", the latest public service film to be completed by Shell-Mex and B.P. Limited, will be shown continuously at the Exhibition in the special cinema constructed by the Ministry of Housing and Local Government. This colour film, which runs for 21 minutes, presents the smoke problem and shows the harmful effect of smoke-laden atmosphere on health and the cost of it to the nation. Attention is particularly drawn to household smoke. The film explains how the local council can give help to the householder and advice on the change they may have to make in order to burn smokeless fuel.

Smokeless fuels will be featured on a number of stands with special displays by the British Coking Industry Association, the Coal Utilization Council, National Carbonizing Company Limited, National Industrial Fuel Efficiency Service, Solid Smokeless Fuels Federation, the National Coal Board and the Women's Advisory Council on Solid Fuel.

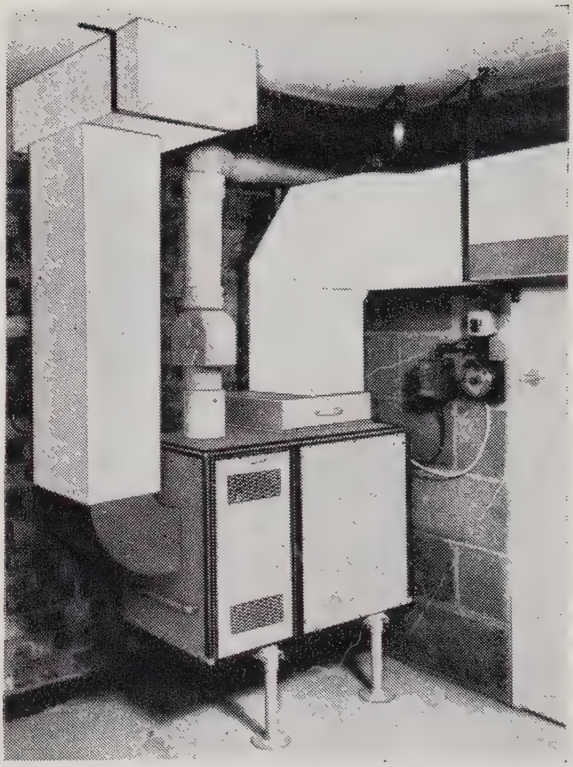
" The Modern Use of Solid Fuel " is a book just published for the Women's Advisory Council on Solid Fuel by Educational Productions Limited. It deals not only with the efficient use of solid fuel in modern space heating, cooking and water heating appliances but contains chapters dealing with the Clean Air Act and safety in the home. Copies will be available on Stand No. A.18.

The use of solid fuel in industry is being spot-lighted on the stand of the National Coal Board. Industrialists will find the stand of the National Industrial Fuel Efficiency Service of particular interest. Panels on the stand will give case histories of firms who, with N.I.F.E.S. help, have overcome their smoke problems and, in so doing, have reduced fuel costs. It is generally agreed that the reasons why boiler plants give rise to smoke are, in order of importance, poor operation, inadequate maintenance and unsuitable equipment. Often, there are special difficulties to be solved—for example, overloading of boilers, the burning of waste materials such as wood, which may involve redesigning the combustion chamber, or the improvement of the draught systems. N.I.F.E.S. regular service agreements help firms to maintain the optimum efficiency on combustion equipment and greatly reduce air pollution from industrial chimneys.

In conjunction with displays of smokeless fuels, there will be many examples on show of heating appliances using smokeless fuels. These include not only open fires but free-standing convectors, open fires combined with boilers, combination grates and warm air central heating systems.

Gas at the Exhibition

The Gas Council has two stands, one devoted to gas and the other to coke. In as far as the domestic chimney is responsible for emitting nearly three-quarters of the smoke over this country, the use of gas in the home is of particular value in fulfilling the requirements of the Clean Air Act. Of special interest in the domestic field are the new developments in central heating which will be displayed on the stand. These include " small bore " central heating, which can be installed in existing houses with a minimum of structural alteration, unobtrusive pipe runs and for a reasonable capital outlay. There are also gas warmed air heating systems to give either economical " selective " heating or full comfort in all rooms, passages and halls throughout a house or flat.



A Potterton 35GS Warm Air Circulator

A representative selection of gas boilers, as well as oil-fired ones, will be shown by Thomas Potterton Limited. All these boilers are fully automatic and, once they are properly installed, require the minimum attention from the user. They are sectional boilers made of cast iron and are designed to provide central heating and indirect hot water supply. There are special versions of some models for the provision of direct hot water supply only. A number of gas fires will be shown including the " GasMiser " on the stand of Cannon (GA) Limited. Incorporated in the design of the GasMiser is the " multyjet " hot air convector and this makes possible the use of gas for continuous room heating at a reasonable price. The latest new Cannon GasMiser is the " Elegant " in glittering gilt lustre.

Electricity and Clean Air

The Electrical Development Association exhibit introduces some of the many ways in which the clean air movement and the community at large can benefit from the replacement of other fuels by electricity. In addition to electric cooking, it is now possible to have cheaper " off-peak " electricity for water heating in many dwellings. Electric floor warming is now becoming an accepted method of heating many new houses and flats. For the modernization of existing domestic commercial or public buildings, the latest unit-plan heaters are available which operate on the same low rates of electricity taken at off-peak periods. A selection of electric fire-lighters specially developed for use with solid smokeless fuels will be on display. Many of these applications are eligible for government grant under the Clean Air Act.

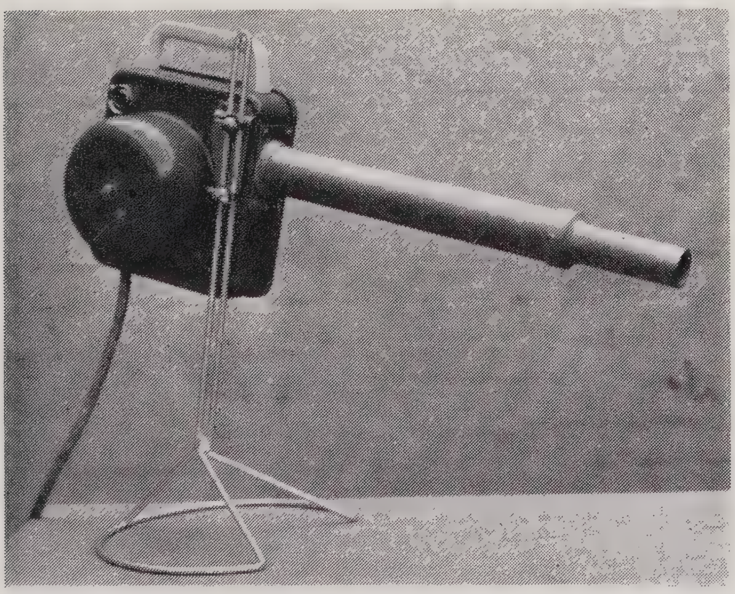
An electric firelighter called the " Matchless " will be shown by Best Products Ltd., a member of the A. C. Cossor Group of Companies.

A new range of domestic heating appliances will be displayed by Falk, Stadelmann and Company Limited which will include the Commodore heater, the Cavalier outset heater, the Concord 2 kW. inset heater, the Cadet inset heater and the Cardinal infra red 2¼ kW. outset heater. Other electric domestic heating appliances will be shown by Morphy-Richards Limited.

A new electric fire-lighter, the Creda Grenadier, for the use with coke and other smokeless fuels will be demonstrated on the stand of Simplex Electric Company Limited.

Heating by Oil

Shell-Mex and B.P. Limited will show on their stand that products of combustion from burning normal fuel oil can be controlled to below Ringelmann 1. Literature on the efficient use of oil fuels will be available and technical staff will discuss any aspects of the use of petroleum fuels in continuous combustion processes. Examples of radiant gravity feed oil heaters will be shown by the Lion Stamping Company Limited.



The Creda " Grenadier " Electric Firelighter

Instrumentation is very important, not only for boilers of all types and sizes but also for power plant, measuring dust, recording industrial gases, etc. A wide selection of these instruments will be shown by James Gorden and Company Limited.

Another company showing for the first time at this Exhibition will be the Carron Company of Falkirk. This well-known firm of ironfounders and engineers will be displaying their new " Calesto " solid fuel fire grate. This cheerful open fire with a restricted throat can be fitted with a heavy duty boiler for heating a room of normal construction up to a maximum of 1,750 cubic feet. Other solid fuel products will include the new " Vespa " house warmer and a selection of electric fires and heaters for floor standing.

Smokeless Incinerators

The last session at the Conference will be devoted to the question of air pollution from the combustion of waste materials. Coming under this heading will be smokeless incinerators, and there will be a practical demonstration by Boston Marine and General Engineering Company Limited in the open space immediately in front of the Exhibition Hall. It is hoped that there will also be other examples of smokeless incineration on show at the exhibition.

Fume Control

Although it is possible for large consumers of fuel such as modern power stations to operate without smoke and grit, no really

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effective method has been found to reduce the emission of SO_2. Objections have always been made to methods which involve washing the flue gas on the grounds that the washed gas is cool and moist and, lacking buoyancy, can under certain conditions descend rapidly to ground level, creating a local nuisance. This difficulty could be overcome if a suitable dry process existed.

On the stand of the Department of Scientific and Industrial Research is a model of a pilot plant erected at Warren Spring Laboratory to investigate the claims made for a dry process developed in Germany. This uses a solid adsorbent which can be reactivated by heating with an inert gas. The SO_2 and SO_3 adsorbed are then given off as SO_2 in a sufficiently concentrated form for recovery and sale. Laboratory scale tests have shown promising indications but no results are yet available from the pilot plant.

The latest development in electric arc furnace fume control comprising a semi-direct method of extraction of the fumes from the furnace will be illustrated by Tilghman's Limited. With this system, the furnace is allowed to relieve its pressure through two additional ports in the furnace roof at points where the escaping fumes can easily be trapped in small hoods and drawn into the exhaust system. By allowing the fumes to escape through these ports, there is less escape of fume at the normal positions. However, to cater for these points, particularly during oxygen lancing, small hoods are fitted at electrodes, pouring spout, charging door, etc. The Tilghman N.T. type collectors are used to clean these fumes. Also on Tilghman's stand will be full details of their range of high efficiency air filter and dust collectors. A demonstration ultra-filtration air filter will be on show filtering the atmospheric air in the Harrogate Exhibition Hall. This new approach to air filtration results in units which give consistent high cleaning efficiencies for periods of operation without any maintenance up to three years.

Reported in our last issue, the Scottish Division visited the Pitlochry Hydro-Electric Station in May. Taken during the visit the two photos, above and below, show the view from the turbine house and delegates watching salmon in the river

THE BENEFITS OF RAILWAY ELECTRIFICATION

The following article, mainly intended for the general reader, was sent to us by the London and Home Counties Electric Traction Society, which was formed in 1953 *and consists of persons " interested in the construction, organization, operation, and development of railed and rail-less transport by electric power " who seek to arouse the interest of the public to the benefits of electric transport. In its own special field, therefore, the E.T.S. is helping to promote the objectives of the N.S.C.A. and we are glad to print the article as a mark of co-operation.*

NO aspect of the British Railways Modernization Plan, announced in 1955, aroused more excitement and satisfaction than the definite proposals for electrification. At last important main lines were to be worked with the most modern power available, and only the shortage of men and materials precluded the electrification of all main lines. Alas, with no real justification, the plan has been whittled down.

Hitherto, Britons had had experience of electric suburban railways, not only in London, but at Liverpool, Manchester, and Newcastle. But the only main lines that had been electrified were those from London to Brighton and Portsmouth, and across the Pennines from Sheffield to Manchester. Only on the latter was all power other than electricity excluded. Regular passengers on these lines knew of their reliability and cleanliness, and were aware that the electric trains were faster and more frequent than the trains they had displaced, or which still operated in other parts of the country.

It was therefore natural that most people welcomed proposals for extensions of electric railways: even those who were not regular passengers could look forward to a cleaner atmosphere, without noxious fumes of any kind; bus passengers were likely to find rail journeys more convenient and amenable; and many country dwellers felt that electricity extensions to the railways would facilitate the provision of electric services for their homes. Few would quarrel with the plan for electrification, even steam protagonists agreeing that electric railways are worthy successors to steam locomotives which have served the world's transport needs so well and for so long. If coal of the proper quality, and in sufficient quantity, was no longer available for steam engines, at least that commodity, of a lower grade, produced within our own shores, would be utilized in generating electricity for the trains of the future.

Electrification of the main lines is a wise choice. Longer freight trains can be hauled faster, while passenger trains, often with one man in the cab instead of two, can run more frequently. On busy lines, the ability to pass more trains over a stretch of line in a given time would often obviate costly track-multiplication, with a consequent saving for the railways. Electric locomotives are equally at home hauling passenger or freight trains, for long periods without attention, giving useful operating economies over alternative forms of power. Electric trains are also able to call upon virtually unlimited power from the overhead wires, and to use it to haul mammoth freight loads, surmount stiff gradients without loss of speed, or to make up lost time; whereas alternatives have not the same overload capacity, diesels being very much limited to their designed power output.

Incidental advantages accrue, such as a reduction in station painting requirements, reduction and simplification of loco depots, withdrawal of fuelling and watering plants, and ash disposal ceases to be a costly headache. Electric multiple unit trains can commence a return journey, if necessary, in no more time than it takes for passengers to detrain and new passengers to entrain, and there is no idle time for a locomotive in waiting to resume work on a different train.

Passengers gain, as has already been mentioned, from faster journeys, a wider selection of trains, and the absence of dirt, fumes, and smoke. Electric heating is more effective than the old steam methods, and electric trains are more brightly lit. One has only to observe how housing developments have followed the electrification of a railway to judge such popularity. In these days of acute housing shortages, an area rapidly develops as soon as it is known that the railway serving the district is to be electrified.

In other countries

One of the world's most profitable railway networks is the Dutch, with all principal lines electrified, and all the promises made to British travellers put into practice. Where wayside stations have been closed, bus services run right to the entrance of the nearest station to connect with trains: in this way, journeys for all are speeded up. The Swiss national network is now all-electric, steam traction having been retained as necessary until, line by line, the network was complete. In Russia, new railways are electrified as they are built; and America's principal electric railroad, the Pennsylvania, sees no good reason to do anything but retain electrification: it should be remembered that these two nations are major oil producers. So Britain should not lag in electrification. Railways will remain the pre-eminent means of transport for as long as anybody can forsee, and electric railways are proving the most economical of all.

Whilst electricity is already a power of good for Britain, produced from our own resources for our own homes and industries, the future increasing use of nuclear power for the production of electricity—the only practical way of harnessing it for peaceful uses—will endow us with an abundance of power, of which the railways can take full advantage. Furthermore, railways operate day and night throughout the year, thus very usefully absorbing electricity's off-peak power supply. Such a valuable load would help to stabilize domestic electricity charges.

Traffic increases on lines electrified in recent years have surpassed all expectations, and can only be described as phenomenal. Receipts on the Shenfield-Chelmsford and Southend line increased 117 per cent., Kent Coast 27 per cent., Manchester-Crewe doubled, Glasgow suburban some 140 per cent., and North-East London 45 per cent. during their respective first months of operation. Some of the passengers are new, fostered by convenient service, some have transferred from buses, and some even from private motoring! Thus the prospects of a good return from further electrification are encouraging, to say the least.

Recent technological developments have brought initial costs of electrification tumbling down. High-voltage current at industrial frequency means fewer sub-stations, lighter overhead wiring and supporting structures, and many other advantages. In fact, large-scale electrification is now financially a practical proposition, whereas older-established methods had made it daunting. Essentially, electric traction is to ordinary railroading what the railway is to the highway—the super-carrier that shows its paces with huge volume: a single crew can handle the tonnage that requires hundreds of lorries. Power can be generated far more efficiently in large central power stations—using British fuel at that—than in thousands of portable power units: consider this, and it is readily seen that railway electrification is a sound policy for transport. And is not the best transport essential to our civilization?

Suburban Services

Electric suburban railways are likely to effect more ease of movement and relief to our cities' overcrowded roads than any other measure. After many years, London Transport's line of thought has at last coincided with this

Society's, and their Annual Report for 1960 comes out strongly in favour of electric railway construction and further electrification of suburban lines. To this we would add that a great deal more effort is required to make Londoners more rail-minded, utilizing better publicity and interchange facilities, and more through bookings between systems. This view is reinforced by the International Union of Public Transport, who at their Copenhagen conference in May this year, opined:

> " Public road passenger transport has not the capacity to deal with mass transportation in the larger cities and in consequence the urban traffic problems in these cities are likely to be overcome in the future by metropolitan railway construction. Where such a railway is in existence it should be the centrepiece of a co-ordinated urban transport system, and other forms of urban transport should be so regulated as to ensure the maximum productivity of the metropolitan railway. Established urban railways must be kept up to date and efficient; the revenue should be sufficient to meet capital commitments. In certain circumstances governmental financial assistance can be justified where the construction of the metropolitan railway confers benefits of a general and social nature on the city and, in particular, where street traffic congestion is relieved."

Only adequate electric railway services are likely to encourage people to make maximum use of public transport: when provided, bus services should be tailored to connect rail-less areas with stations, to fill in the gaps in the rail network, and provide cross-suburban facilities. Such measures will help to lessen street congestion.

Many urban motorway projects should incorporate a suburban railway in the median strip. Chicago has successfully pioneered this development, which ensures that road space is entirely free of public transport. Stations are situated where ordinary roads pass over or under the " expressway ", and are connected only to those roads. The Chicago Transit Authority estimates that 20 per cent. of the expressway surface area is used to move 80 per cent. of the passengers. Such facilities would be of priceless value in London.

As electric trains have rapid acceleration, it is possible to site stations fairly close together on suburban lines —say two or three per mile—without unduly lengthening journey times. It is then possible to avoid the provision of a supplementary bus service to cater for local traffic, and a saving of resources is achieved.

In the United States, where there is a growing realization that mass-motoring is impracticable in populous cities, an Institute for Rapid Transit has been formed this year to study the promotion, expansion, planning, and development of rapid transit in metropolitan areas. "Rapid Transit" can be defined as any means of moving large numbers of people at frequent intervals in metropolitan areas, and takes the form of an electric railway operating on its own segregated track. In some cases, modernized electric tramways meet the need.

It is also of interest to note the recent report of the Middlesex Highways Committee, stating:

> " The time has come for a complete re-appraisal of the travelling conditions in the London area in all their aspects. All the factors affecting travelling conditions must be considered as inter-related parts of one problem."

Further views with which this Society heartily concurrs, and which we have been stating for years: only it takes a long time for Authority to hear any Voice other than its own.

Of particular interest to city developers is the possibility of placing electric railways underground, with sale of the surface land: or leasing the air rights above electrified stations. The latter case is being put into effect at Victoria, where an air terminal has been constructed above the platforms. The former case could well be developed in conjunction with the linking of London's terminal stations. The cost is high, but the sale or lease of the land released would amortize initial expenditure. Brussels offers a precedent for such action, and the shallow railway tunnel under the city centre has linked formerly separate systems into one network.

With the multitude of advantages that railway electrification offers, it is worthwhile considering whether the country would not reap unlimited benefits from pressing all our resources into this objective, and not meantime expending much energy and capital on diesel operation. Even although this meant retaining steam traction as an interim measure, any loss resulting to British Railways could be borne by the nation as the payment of the premium on an insurance policy to insure that at least our railways would continue to operate in the event of a stoppage of oil supplies. In the past when this has occurred, everyone has been thankful that the railways were still able to provide transport. We ought not to risk being without rail transport as well as road.

The safety aspect of railways must not, under any circumstances, be overlooked. Railways remain the safest form of transport, while road accident figures soar to dreadful heights. As a railway is a strictly disciplined and closely controlled machine, it is possible under modern conditions for high-speed trains to follow at close intervals—100 m.p.h. every two minutes, for example—in perfect safety. Here is a way to reduce accidents in rural roads or city streets. In 1960, on some 17,000 miles of line, only six railway passengers were killed: on the short M.1 alone, a relatively safe highway, in the same period there were 22 fatalities. The passenger fatality rate in train accidents was 1 in 261 million passenger journeys, an extraordinarily low figure.

Whether or not electrification brings advantages to us personally by affording faster journeys, more frequent trains, or a cleaner atmosphere in our towns, of one thing we can be certain—no other single factor could bring as much benefit to the nation as railway electrification. —*E.R.*

Umbrella Arresters

Stainless steel " umbrellas " with a curtain of water are helping to keep the air clean at Trafford Park, Manchester.

A steel dome is suspended over the top of each of the chimney stacks of the cast-iron melting furnaces at AEI's No. 1 foundry.

" The domes which form part of the new grit collectors have water continuously sprayed on to them," an A.E.I. spokesman said.

" The water cascades off the edges forming a curtain between the dome and the outside casing of the grit collector.

" As the smoke rises up the chimney from the furnace, it strikes the underside of the dome and is deflected outwards so that it must pass through the curtain of water.

" By this means much of the grit and dust and some of the toxic sulphur gases are washed out, thus reducing the contamination of the atmosphere," he added.

The scheme was produced by A.E.I. works engineers' department, in consultation with foundry staff.

—*Manchester Evening Chronicle*

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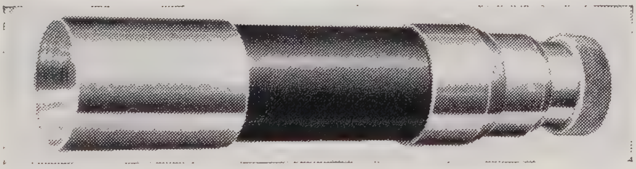

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NEW PUBLICATIONS

The British Coal Utilization Research Association annual report for 1961 is a solid record of a great deal of work done. The Association's income for the year went up to £482,941, much of it from contracts and fully-endowed research.

In the Report it is pointed out that changes in the pattern of availability and consumption of fuel lead to changes in the balance of short and long term research on coal utilisation; much of the work of the Association is now concentrated on a comparatively few clear-cut projects.

Owing to competition from oil, much emphasis has been placed on automatic boiler equipment, particular attention being given to inexpensive coal-handling equipment for small plant. The effects of the ½mm content in washed smalls has been further studied.

Analysis of the results of the field trials carried out some years ago on the small pipe central heating system with the automatic control developed by the Association, has confirmed low running costs as well as low installation costs. The need to improve solid-fuel-fired boilers for central heating in single houses has led to the initiation of a major research.

In its broadest sense, the objective of coal utilization research at the present time is to make the most effective use of all the coal raised to the surface. This requires that all sizes and all qualities must find a market. Although the emphasis of the Association's work is subject to further changes as new problems arise, many of the present programmes are contributing to the advancement of the technologies of coal utilization; and, for this reason, the results will be useful both now and in the future. Moreover, the value of the unspectacular advances found in traditional industry must not be underestimated. The total fiancial reward accruing from even marginal economies in a large-tonnage heavy industry can be considerable: an increase in the efficiency of industrial boilers of only 1 per cent. could lead to a potential financial saving of over £1 million p.a. on a national scale.

* * *

Of similar size and scope, one bound in red and the other in olive, the annual reports of the **Electrical Association for Women** and of the **Women's Gas Federation,** come to hand together, thus revealing how much the two organizations have in common. In only one respect do they diverge in their purposes! Otherwise a merger might be possible. This is not altogether as frivolous a remark as it may seem: after all they do come together (with the third kindred body, the Women's Advisory Council for Solid Fuel) as members of the N.S.C.A. and with valued representatives on its Council. As their reports show, both the W.G.F. and the E.A.W. are doing a very good educational job, nationally and through their many branches, and in promoting the things in which they are especially interested they are promoting clean air and cleaner, warmer and more easily run homes. Oddly enough that well-known young woman, Mrs. 1970, doesn't seem to have an association to belong to!

* * *

Air Pollution is the modest title of a brochure published by Evans Electroselenium Ltd, of Halstead, Essex. It is much more than a trade brochure. It includes reprints of a number of important technical papers on the measurement of air pollution, the measurement and analysis of smoke, the measurement of dust from chimneys, field measurements, and the assessment of sulphurous pollution. It further describes and illustrates the instruments developed by the Company for dealing with these problems —their smoke stain reflectometer, a recording flue dust monitor, the " E.E.L." dust pollution absorbtiometer, and the " E.E.L." SO_2 meter.

These instruments are all designed to do specific jobs with certainty and precision, and have been designed in consultation which such bodies as the Central Electricity Research Laboratories and the Warren Spring Laboratory. Sound, informative publicity of this kind is very useful and—well, in short, good.

REVIEW IN VERSE

Professor R. S. Scorer has contributed this review of the two volumes of " Air Pollution ", edited by Arthur C. Stern, U.S. Public Health Service (Academic Press, New York and London. Vol. I. pp.656; 143s.; Vol. II., pp. 586, 132s.) We have only just received our own review copies and hope to notice them further, if in a more pedestrian way, in our next issue.

Quoth Glenn, I turned the spacecraft round
  for I was very loth
to backwards-face and only see
  where I had been, unquoth.
A moral here for everyone
  who wants a real solution
to problems and the nuisance caused
  by growing air pollution:

With Stern guidance nearly fifty
  authors write a book:
authoritative certainly
  with Academic look;
presents a vast amount of know-
  ledge, probably a glut;
except for stonework everything
  is treated nicely. But

on controversial things the writ-
  ers show the banal qualities
of non-committal platitudes
  and tedious generalities.
A thousand authors' paper have
  been chewed if not digested,
but whether they will waste your time
  to read is not suggested.
'Thomas shows . . .' and 'Smith assumes . . .'
  while 'Jones and Brown surmise . . .'
and never 'This is rubbish, that
  is good', or 'Todd is wise'.
The references are mostly inci-
  dental trite or rotten
Yet all but basic principles
  should surely be forgotten.
But where to find the fundaments
  will aggravate and vex
all those who search these lexicons
  by way of the index.
We look a problem up and find
  it mentioned once or twice;
we're given all the references
  but no succinct advice.

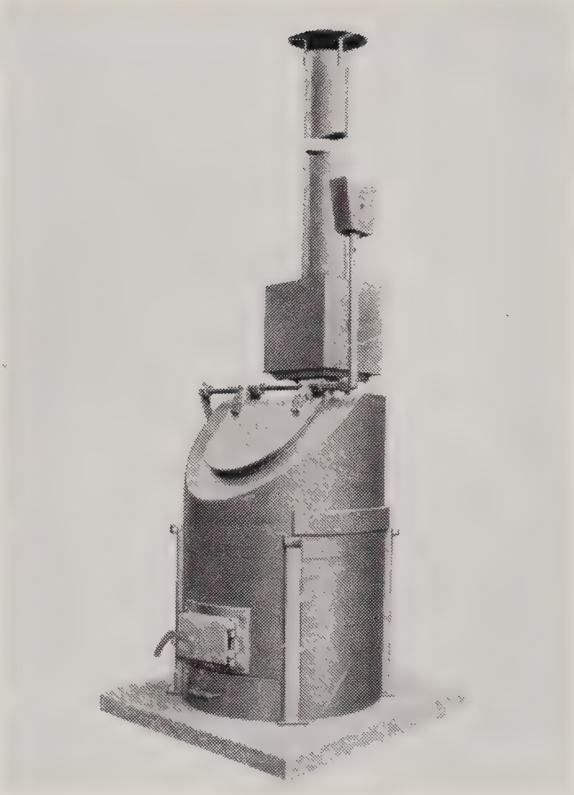
Facts and fanciful ideas
  are plainly too abundant,
but in polite society
  brief wisdom is redundant.
All thousand authors must be named
  in detail one by one,
and useless work can't be ignored—
  it simply isnt done.
The writers show off knowledge and
  the detail's overrated.
There simply isn't time for it
  and life's too complicated:
The novice faced with so much stuff
  has confidence destroyed
while older, more experienced men
  will only be annoyed.
No guidance has been clearly risked,
  unless it's safe of course,
take for example, plume dilu-
  tion—my old hobby horse:
All known formulas are given
  with full references
while what we want is not them all, but
  only preferences.
With each exercise we find
  a nice idea unfurled
but all completely useless in
  the beautiful real world.

We muddle through in spite of all
  the scientists' pretentions
but in this field success must be
  the daughter of preventions.
Our system of accounting gives
  no praise or just reward
to those who serve to stop the filth
  from being first outpoured.
We know what does the damage and
  we know what isn't good
but nothing's done because its not
  completely understood.
Researchers feel that politics
  is not all their dish,
though most effective action stems
  from politicians' wish.
We go on making dirty air
  while homo in the street
avoids it if he can like things
  he chooses not to eat.

These authors have assailed their task
  with competence—and more, although
the Air Pollution Handbook had
  done most of it before.

In face of more complexity
we need much more defiance,
to clarify the issues and
not blind the folk with science.
We have the know-how and the wealth
but nothing do until
our view of life provides us al-
so with determined will.
We're fallible, of course, but must
we always gasp for breath
until we fully understand
the chemistry of death.
'We want clean air' you say: but face
this damaging rebuff—
Till things are catastrophic you
dont want it quite enough!

A NEW INCINERATOR



Smokeless Air was represented at a recent convincing demonstration at Croydon of a new incinerator manufactured by Thomas McDowell Ltd. (Green Dragon House, High Street, Croydon). Its name, the Smokeless Zone Incinerator, explains its objective, and it has been designed to deal with waste materials and refuse in a way that will meet the requirements of a smoke control area.

The entry of air into the furnace and the chimney draught are controlled. Secondary air is introduced into the top of the furnace through a series of ports, thus controlling the height of the flame, giving a better mix and supplying extra oxygen. The secondary air is supplied by a centrifugal electric fan, which is secured to the shell of the incinerator. These factors, combined with the high-grade refractory (or keyed fire-brick) lining, produce conditions of intense heat and the mixing necessary for good combustion. The unique secondary furnace fitted to the top of the incinerator is designed to complete the combustion of residual smoke. It has a simple control box fitted with a standard, fully automatic pressure jet oil burner. There is a photo-cell, flame failure, detection device.

Difficult wastes, such as rubber, plastics and wet wastes from hospitals and factories, are dealt with by the introduction of auxiliary firing using oil, or town gas, (Propane may be used in areas without the latter), into the bottom of the furnace, which assists the complete combustion of the material. Economic operation is assured by the provision of an automatic timer which is preset by the operator. This auxiliary firing can be fitted to all models in the Zone Incinerator range.

Grit emission is prevented by a " low resistance " grit-arrestor set in the chimney, which effectively stops all grit without impairing the draught.

All models are supplied complete including the chimney with its three-way set of guy wires. If it is wished to use an existing flue, special connecting ducts can be supplied. On delivery the Zone Incinerator is ready for operation, the only " on site " work required being the laying of a concrete base, the erection of the chimney and connection of oil or electric supplies.

Three models are available and have respective capacities of 10, 20 and 40 cwt. of general refuse per eight hour period. Their dimensions are 2 ft. 8 in., 3 ft. 5 in. and 4 ft. 5 in., in diameter and 5 ft. 0 in., 6 ft. 3 in, and 6 ft. 3 in. in height less chimneys, the average height of which is 25 ft. 0 in.

Professor Pybus on Cancer

At a recent meeting of the Northumberland and Durham Local Authorities' Committee for Clean Air an address was given by Em. Professor F. C. Pybus, University of Durham and Consulting Surgeon, Royal Victoria Infirmary, Newcastle upon Tyne, on " Cancer and Atmospheric Pollution."

After discussing the known association of tars with cancer the speaker examined the suspect compound, benzpyrene. He gave a table showing that the total quantity of benzpyrene produced annually from the coal burned and the tobacco burned in this country is:

Quantity burned	
Coal	180,000,000 tons
Tobacco	117,607 tons
Benzpyrene produced	
From coal smoke	750 tons
From tobacco smoke ..	8 lb.

On the burning of leaves and wood Professor Pybus said: " The harmful effects of tobacco smoke are well known, but the same from burning leaves and garden rubbish should be equally condemned ". A sample of such smoke had shown it contained 70 parts of benzpyrene per million parts of free carbon, and he concluded that the total amount of benzpyrene from these sources exceed that from tobacco.

Professor Pybus pointed out how the general atmospheric pollution is not only inhaled but contaminated food and clothing and all else on which it fell. He cited the incidence of cancer among laboratory animals, which may be so common that it upsets experimental work. A sample of dust from an animal house was found to contain 67 parts benzpyrene per million of free carbon. This finds its way into the food, bedding, etc., while animals which lick themselves clean get additional doses.

Seeking to put the role of tobacco smoke into its proper perspective, the speaker said that if his argument was correct " some of the heavy smokers give themselves that added dose of benzpyrene which determines its development, for it may well be doubted if smoking alone ever gave anyone lung or other cancer, apart from perhaps that of the lip ".

Two of Professor Pybus's *dicta* must be quoted: " Man has conducted a long-term experiment on himself by living in a smoky atmosphere and seeing who would get cancer ". And: " The motor engineers are sufficiently solicitous for the welfare of their engines as to filter the air which they breathe. They are, however, sufficiently indifferent to the welfare of humans as not to filter the poisonous exhaust."

NEW POWER STATIONS

The Central Electricity Generating Board are to apply to the Minister of Power and the local planning authority for consent to the establishment of a coal-fired power station at Ratcliffe-on-Soar some seven miles south-west of Nottingham. The station would be of about 2,000 MW (2,680,000 horse power) capacity and would consume over five million tons a year of East Midlands coal.

The Board are also to apply to the Minister of Power and the Local Planning Authority for consent to the establishment of a second power station at Aberthaw, near Cardiff, in South Wales. The demand for electricity is rising rapidly and in South Wales the needs of industry form a particularly high proportion of the total. The new station will make a valuable contribution towards meeting the increased demands from both industrial and other consumers.

The station will be of 1,500,000 kilowatts (2,000,000 horsepower) capacity comprising three 500,000 kilowatt generating units, two of which will be installed initially. Together with the existing stations it will be capable of making full use of the coals which are expected to be available in South Wales for electricity purposes for many years to come.

AN UNDERFEED SHUNTING LOCOMOTIVE

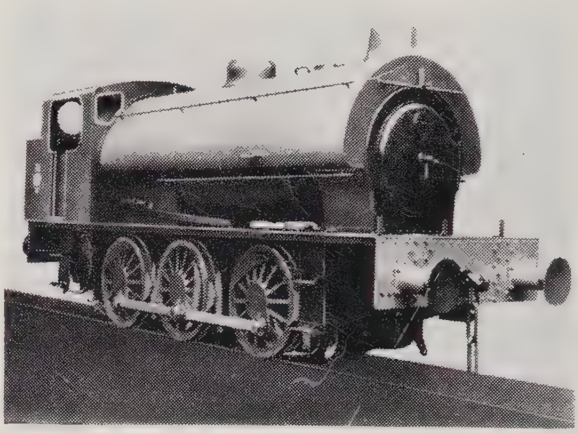
Dark Smoke Eliminated

In many works and mines smoke emission from shunting locomotives is one of the most awkward problems in the prevention of pollution to meet the requirements of the Clean Air Act. In view of the kind of work it has to do a coal-fired locomotive that would operate with little or no smoke has not seemed likely. It is therefore of special interest to report on the "Hunslet" automatically fired shunting locomotive, the effectiveness of which in reducing smoke to well below the dark smoke level has been confirmed to us by an experienced smoke inspector. As the photograph shows, this locomotive is in use by the National Coal Board.

It combines underfeed firing with a gas producer system, and in addition to its freedom from smoke it allows small coal (down to ½ in. singles) to be used, with resultant savings in fuel costs. The power output is increased as a result of reduced back pressure in the cylinder.

The locomotive is the product of the Hunslet Engine Co. Ltd., of Leeds. It is of new design and has been specially developed to overcome the difficulties of operating under the Clean Air Act. The system comprises four basic sets of component which have been specifically designed to operate harmoniously in producing a maximum of fuel availability and economy, a minimum of cylinder back pressure giving improved performance, and the absolute minimum of grit and smoke.

The four units, for which patents have been applied for, are (1) the underfeed stoker, (2) the gas producer system, (3) the jet system, and (4) the blast pipe arrangement.



The small grate area available with the normal type of underfeed stoker makes it impossible to burn a sufficient weight of fuel to maintain the high rate of steaming necessary to retain the locomotive as an efficient and economic unit, quite apart from the complication of the forced draught blower that is required. A new approach was necessary and after much experiment a method of feeding the maximum amount of coal which the boiler required was evolved by Hunslet, together with an arrangement of final feed which allowed the coal to be spread accurately over the whole of the firebox grate, giving the best conditions for smoke-free combustion.

With this design any amount of coal can be fired without difficulty, and one model can take up to 2,000 lbs. of coal per hour. The operation contrives a hot thick fire at the back and sides of the firebox where it is most useful, with a rocking and drop grate in the centre forward section of the grate, to which the burnt material naturally gravitates and can then be dropped into the ashpan by a simple operation of the rocking lever. Basically, the stoker consists of a reciprocating plate to which motion is imparted by a steam cylinder, which is in turn controlled by a valve mechanism.

The Gas Producer

The gas producer system deals with

one of the problems associated with underfeed stoking and the use of small coal—clinkering. This is avoided in the Hunslet system by the introduction of steam to the ashpan. It comes from two sources: the exhaust from the stoker cylinder and a " live " steam pipe controlled by a valve. This can be used either continuously, depending on the clinkering properties of the coal or as a stand-by when the stoker cylinder is not working. The function of this steam is to ensure a relatively cool firebed with the actual burning of the gases taking place above the firebed and in the firebox. This lowered temperature prevents the formation of clinker and ensures that the fire remains clean and free-moving. To ensure the complete combustion of these gases a special arch has been designed to ensure the maximum use of the firebox volume, and this together with ample secondary air and the necessary turbulence completes the combustion very much better, it is stated, than has ever been achieved on any locomotive previously.

The turbulence referred to is especially necessary when the locomotive is working hard with a heavy blast, and stoking heavily, or when being lighted up from coal. To cope with these conditions a system of steam jets and ports to admit secondary air to the firebox has been designed so as to give a forward flow over the fire and back up under the brick arch, during which period even the worst smoke conditions can be controlled.

Finally, to complete their review of combustion techniques as applied to the steam locomotive, conditions within the smokebox were examined. The new design that has been evolved meets basic requirements: (1) aerodynamically efficient ducts entrain maximum gas volume for minimum steam flow; (2) a new blower makes use of the same flow arrangement and is said to be infinitely better than any of the old designs; (3) the divided equal-area, streamlined exhaust flow gives a major reduction in back pressure; and (4) a smokebox " tuning device " allows smokebox draught to be matched to the type of fuel being used.

Electric Town Runabout Car Needed

In a recent debate in the Commons on the Finance Bill Sir Wavell Wakefield referred to the way in which the imposition of purchase tax can prevent an industry from even starting to produce something that could become a useful export. Such an item was a small battery electric town runabout passenger car which at present could only be produced in small numbers and thus at relatively high cost, and which, with the addition of purchase tax, resulted in a prohibitively high selling price in the home market.

The Government exhorted industry to export and they know well that a reasonable home market for many products was a necessary foundation for establishing an export market.

The electric vehicle industry felt that it could develop a useful export trade in small electric runabout cars provided it could establish a home market. Purchase Tax however prevented this, and a start being made.

At present there is no revenue from purchase tax because such a small electric car does not exist therefore remission of tax would not entail loss of revenue. Without the tax a new industry could be started which would enable future revenue to be created.

Other important reasons for the production of such a vehicle are that it does not emit fumes; it is silent and not dependent on imported fuel, and the batteries can be charged at night when the electricity supply system of the country needs load. All these are benefits for the community. Sir Wavell Wakefield appealed to the Government to refrain from imposing purchase tax on such vehicles.

Refresher Course—N.I.F.E.S. are holding their 9th annual refresher course on " Current Practice in Fuel Efficiency " on September 24-28, at the Clarendon Laboratory, Oxford.

A NEW OIL-FIRED LIME KILN

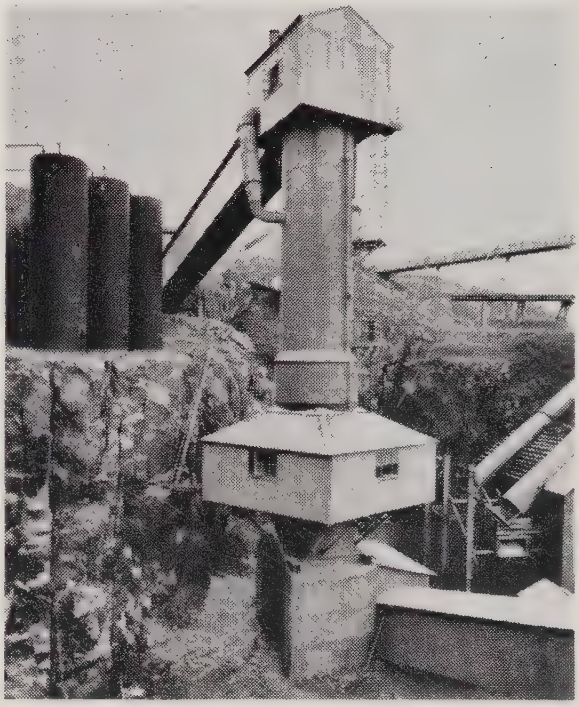
Smoke Reduced

Smoke from lime-burning kilns is one of the difficult pollution problems that have hitherto defied satisfactory solution. New techniques for burning with coal, the traditional fuel, are being tried, and in addition there is a completely new oil-fired kiln, which it is stated reduces smoke considerably—with steady working below Ringelmann No. 2 and with No. 1 as the aim with further experience.

The new method overcomes the problems associated with the direct application of conventional oil burners or gasifiers to shaft kilns, and is incorporated in a completely new kiln developed and patented by West's Gas Improvement Co. Ltd., in collaboration with Catagas Ltd., and lime-burning and oil interests. The first commercially installed unit, which we illustrate, has been in successful operation for some months.

The new process, based on the Catagas system, offers for the first time a simple, reliable unit, low in first cost and well suited to the needs of the lime burning industry. The kiln gives shaft outputs in excess of one ton lime/sq. ft. cross sectional area per day for continuous working and the Catagas oil units are designed to operate on the cheaper residual oils (3,000 sec. Redwood No. 1). Thermal efficiencies are high and with heat inputs of less than 5,000,000 Btu, total fuel costs including electricity can be under 25s. per ton lime for continuous working at nominal capacity.

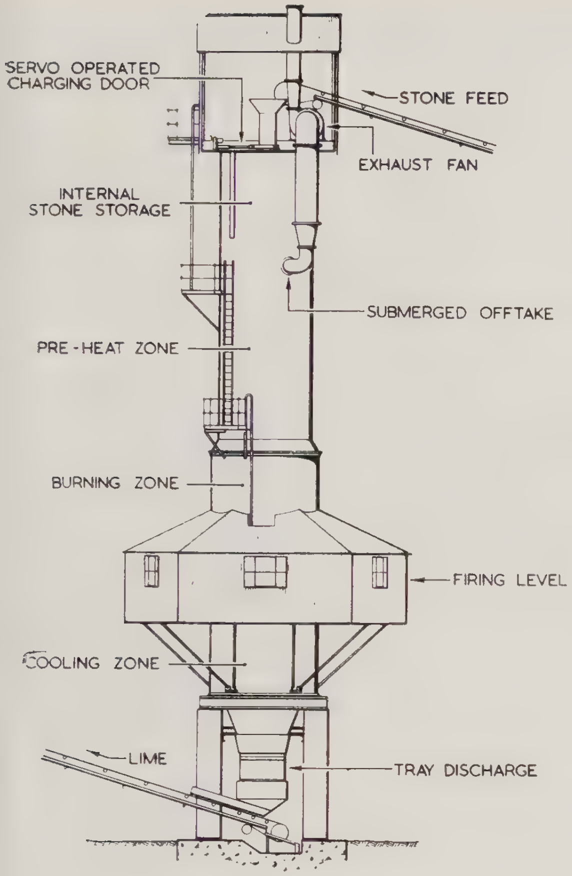
The success of the kiln is due to the development of the Catagas system which is a completely new approach to oil gasification. The kiln itself is of conventional gas kiln design and the Catagas units are fitted at the base of the burning zone. Heavy oil is flash vaporized in these units and the vapours pass directly into the stone where cracking and gas formation are completed. The quality of the gas made is regulated by the controlled admission of air and recirculated waste gases, and all heat release takes place inside the kiln. Air for combustion passes up through the cooling zone so that full recuperation of heat from the lime is obtained.



The West's-Catagas Kiln

The standard kiln has a straight shaft of 7 ft. 6 in. internal diameter, designed to ensure free movement of the charge without any need for rodding. It has a nominal output of 50 tons of lime per day and is constructed with a fully insulated refractory lining. Stone is admitted at the top via a servo-operated door, remotely controlled, and lime is extracted from the cooling zone at the base by an adjustable feeder which provides even drawing conditions. Waste gases are extracted through a submerged off-take, above which there is internal stone storage equal to six hours on full load.

The Catagas units, fitted round the kiln at the base of the burning zone, are located in a burner house with the



Section of the Kiln

necessary oil heating and pumping gear, switchgear, controls and instruments. The process is controlled from that level and one operator can supervise the firing of several kilns.

The potential advantages of oil firing are well-known; they include a low level of smoke emission, a high grade low-sulphur product free from ash contamination, low fuel cost and freedom from fuel handling problems.

Additional advantages of the Catagas system over any previous oil-fired systems are its simplicity and reliability, its ability to handle closely graded stone at full output down to 3 in. minimum size, the direct visual control of burning conditions without the need for expensive instrumentation, and the ease of shutting down and starting up to requirement; full production can be reached in 5-6 days from cold and within 24 hours after week-end shutdown.

The first commercial installation of West's Lime Kiln—at Beswick's Lime Works, Hindlow, near Buxton—was a West's Group operation, four Group Companies being represented. In addition to original design and technical supervision by West's Gas Improvement Co. Ltd., the reinforced concrete feed hopper and general foundation work were by West's Piling & Construction Co. Ltd., and the control gear by Tully Engineering Co. Limited. Erection was by West's Works Limited.

Greek Ship Fined

In all cases where it appears to the Officers of the Hull and Goole Port Health Authority that any vessel is likely to contravene the Clean Air Act, it is the practice, whenever possible, for the officers to board and give verbal warnings. In June last this procedure was carried out on seven vessels, and in six instances no further action was necessary.

In the seventh case, the m.v. *Kapetan Kostis* (Greek) continued to contravene the Act. This vessel was in the Port of Hull in June 1959 and emitted dark smoke continuously during her stay. On that occasion repeated warnings were given to the Master and Owners but as it was the vessel's first visit to the port since the Clean Air Act, 1956, came into force, no legal action was taken. The Master and Owners, however, were informed that should the vessel return and further contravene the Act, legal proceedings would be taken.

On Monday, June 25, 1962, the vessel was observed to be making dark smoke and the usual warning was given. Further observations were carried out on June 26, when the vessel made dark and black smoke in excess of the periods prescribed in the Dark Smoke (Permitted Periods [Vessels]) Regulations, 1958, and it was decided to take legal proceedings against the Master under the provisions of the Clean Air Act, 1956. The Authority's Prosecuting Solicitor was informed accordingly.

The vessel was kept under observation on June 27 and 28, and further contravened the Act.

Three informations were laid against the Master of the ship and the case was heard in the Magistrates' Court on Monday, July 2, when the Master was fined £20 for each offence.

AIR POLLUTION ABSTRACTS

609. Development Work on a Combustion System for Vehicle Diesel Engines. Pischinger, F. and List, H. (In German and French.) (9th Congress F.I.S.I.T.A., Inst. of Mech. Engrs., 1962.) Due to heavy demand made by modern diesel engines on the combustion process, practising engineers have not yet decided unanimously on a definite process. The paper describes experiments which are carried out by the AVL to develop various combustion processes and the problems encountered.

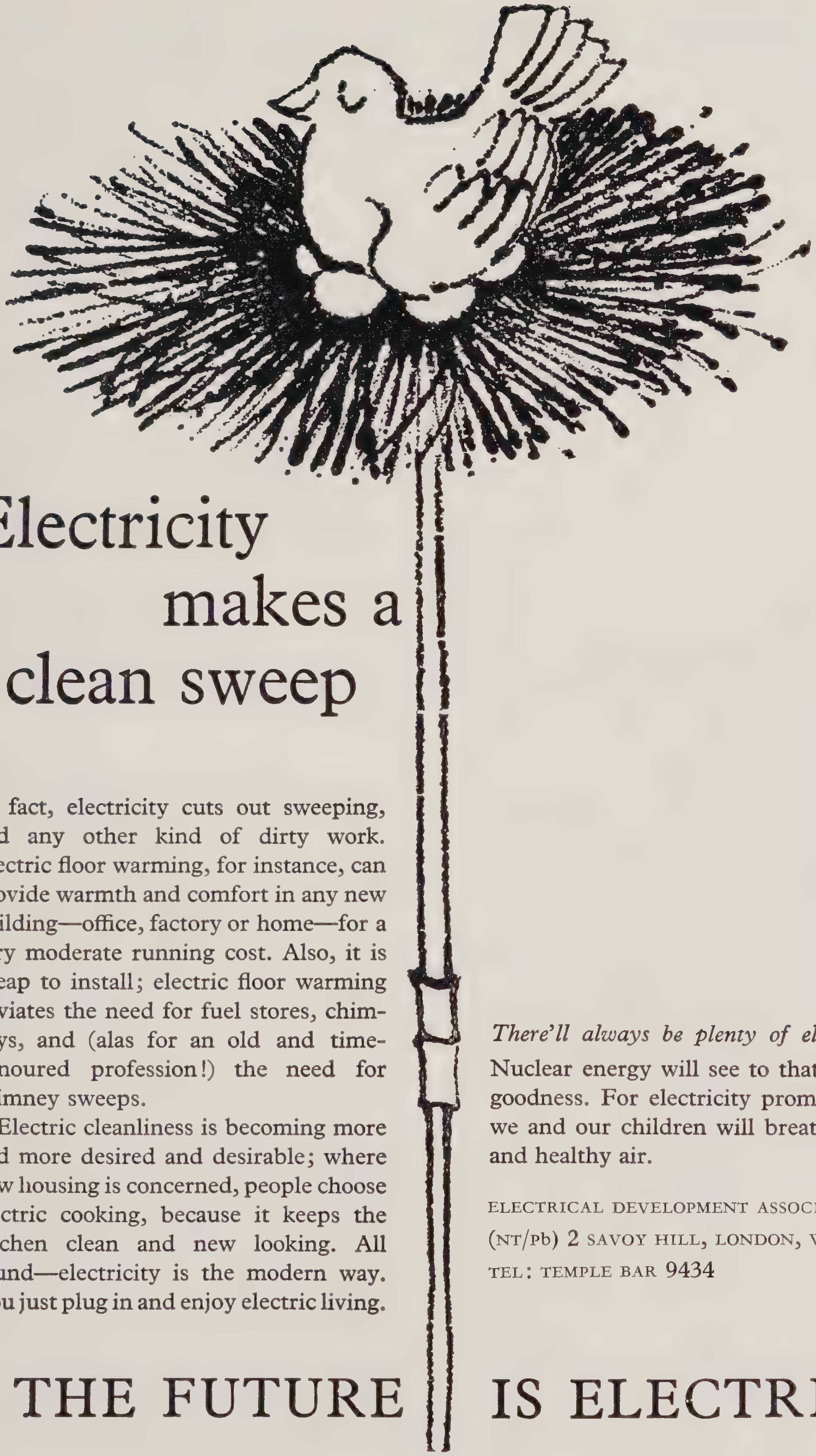
610. The Measurement of Smoke Density of Exhaust Gases from Diesel Automobile Engines. Malschaert, F. R. (French and German) (9th Congress F.I.S.I.T.A., Inst. of Mech. Engrs., 1962.) Research has been undertaken in Belgium from 1959 to 1961 to discover best method of measuring exhaust gases from diesel and automobile engines and to find suitable limits for their density. After outlining the probable chemical and physical characteristics of exhausts, Prof. Malschaert illustrates main causes of their formation and reviews some apparatus and methods used for measurement. Two forms of apparatus have been studied in detail: the Bosch exhaust gas meter and the Hartridge meter. Reasons are discussed why one of them was modified after a large-scale experiment in Belgium. The author describes the test method used: called the " freely accelerating engine " method. Finally the paper deals with practical applications—made in various countries—of the different apparatus and methods, both in the field of measurement and for fixing limits for exhaust gases from diesel and automobile engines.

611. On the Choice of Carbon Monoxide as Test Substance of Pollution from Exhaust Gases of Motor Vehicles. Application to the study of atmospheric pollution of Paris in 1960. (In French.) Moureu, H., Chovin, P., Truffert, L., and Lebre, J. (Revue de la Poll. Atm., April-June 1962, No. 14, 187-209.) The authors propose, with certain reservations, two scales of pollution level and of absorption level in the human body for products emitted by motor vehicle engines. These scales rely on the measurement of carbon monoxide taken as test substance either in the inhaled air or in the blood. The choice of carbon monoxide is dictated by the ease, precision and speed with which the analyses can be effected and also by the fact that carbon monoxide being itself toxic, is representative of other less well-known but equally toxic substances in exhaust gases.

612. The Study of Atmospheric Inversions in Low Layers by the Method of Radio-Sounding. (In French.) Bellet, M. J. (Revue de la Poll. Atm., April-June 1962, No. 14, 210-241.) This study was undertaken as part of the general research on the prevention of atmospheric pollution by the Heat Production Service of Electricity of France, in 1961. Radio sounding is taken by means of a balloon which transmits automatically on short waves to the ground, data on pressure, temperature and humidity of the various atmospheric layers. The paper describes the principles of radio sounding, the precision and frequency of measurement and the equipment which is necessary. Results from the first six months' study are tabulated and the conclusions drawn that the present method of radio sounding is the simplest and best way of obtaining quick results.

613. Practical Suggestions for the Reduction of the Emission of Smoke, Dust and Grit from Coke Ovens. British Coke Research Association. (Chesterfield: The Association, May 1962, Special Publ. 5, 12 pp.; S.-C., June 30, 1962, vol. 20, 746.) This publication is intended as a useful summary of information for those seeking guidance in dealing with atmospheric pollution problems at coking plants.

614. Cancerogenic Properties of Motor Transport Exhaust Soot. (In Russian: English Summary.) Gurinov, B. P., et al. (Gig. Sanit., 1962, vol. 27, (2), 19-24; Bull. Hyg., June 1962, vol. 37, 545.) The results of investigations revealed that average contents of 3, 4-benzpyrene in the soot of a carburettor motor comprises 0·02 per cent. and that of diesel—0·0001 per cent. Skin applications and intradermal injections in biological tests on mice have shown that in the majority of cases the soot from the carburettor motor caused development of malignant tumours, whilst the soot from diesel engines did not produce any tumours at the site of its introduction. Certain practical suggestions are made.



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THE FUTURE IS ELECTRIC

615. Report of the Swiss Commission on Leaded Gasoline, 1947-1960. Anon. (In German.) (Mitt. Lebens. Hyg., 1961, vol. 52, (3), 135-244; APCA Abs., June 1962, vol. 8, 1). The quantity of lead in the exhaust gases from cars varies much and amounts to about 20-50 per cent. of the lead present originally in the gasoline. It consists mainly of inorganic lead salts with traces of volatile organic lead derivatives. It may reach much higher levels at higher motor speeds since the lead deposited in the exhaust pipe is then swept off by the gases. The lead particles have a diam. which averages less than 125μ and so behave practically like a gas. The few larger particles quickly fall out of the air. The quantity of lead absorbed by the lungs averages 60 per cent. of the lead present in the air. The average city person, with no special exposure to leaded gasoline, takes up daily 20-30μg of lead from the air by breathing. It is concluded that tetraethyl lead in gasoline has not and is not currently endangering health, but that it might become a problem since the content in the air is increasing as traffic increases and since no substitute has yet been found for lead in the manufacture of gasoline. (Abridged abstract.)

616. The Law Against Atmospheric Pollution and Odours, Amending the Law of Dec. 19, 1917. (In French.) Levantal, M.G. (Rev. A.P.P.A., July/Sept. 1961, vol. 3, 148-164; APCA Abs., June 1962, vol. 8, 9.) The text is given of Law No. 61-842 of Aug. 2, 1961, relative to control of atmospheric and odour pollution, which amends the law of Dec. 19, 1917. The law is discussed as to the provisions and measures for its application; justification for the new law; field of application of the law; administrative powers and administrative sanctions; judiciary sanctions; civil sanctions; role of public organizations, laboratories, and private organizations; and conditions necessary for implementing the law.

617. Air Pollution and its Control in the Steel Industry. Sussman, V. H. (Iron Steel Engr., May 1962, vol. 39, 80-85.) The author discusses the causes and prevention of air pollution from blast furnaces, beehive coke ovens, byproduct coke ovens, sintering plants, and open hearth furnaces, and research being carried out on coal burning operations. He recommends that control devices be incorporated in preconstruction phases of new plants and processes and be regarded as an integral part of plants, and that plant operations should have a public information and relations programme.

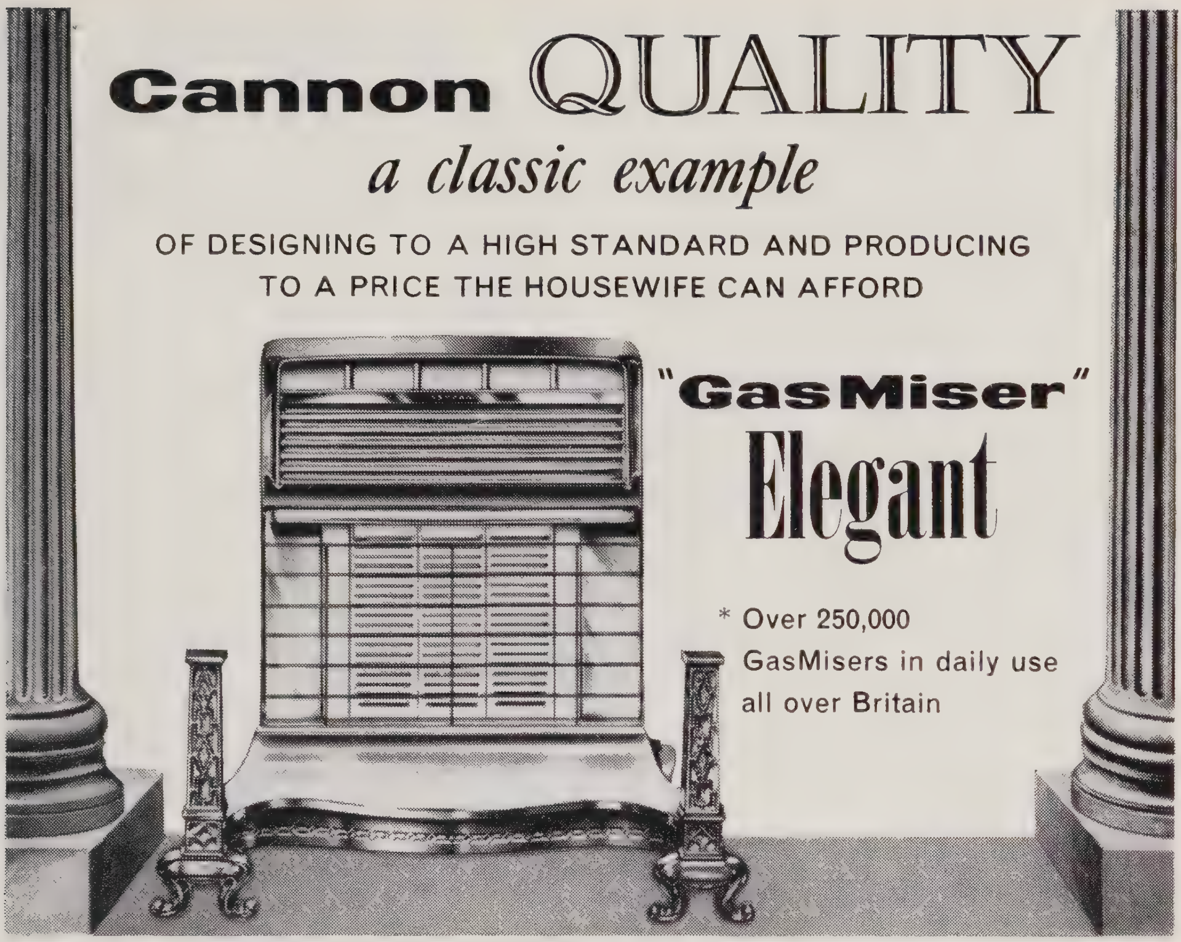
618. Reducing Coke-Oven Smoke. Anon. (Steel and Coal, April 20, 1962, vol. 184, 777.) A coal-charging car with hydraulic controls, developed by the Woodall-Duckham Construction Co. and now in use at the Avenue carbonisation plant of the East Midlands Coal Board, has solved the problem of smoke emission from coke ovens. This car lifts and replaces the oven lids, while each of the four hoppers discharges its coal in a sequence designed to keep the smoke inside the oven battery. The East Midlands Coal Board has now decided to spend another £14,000 on replacing the plant's second charging car.

619. Carbon Monoxide in Car Exhaust. Anon. (B.M.J., June 2, 1962, [5291], 1567, [L].) A question is raised concerning variations in CO concentration at different levels above the road, and different traffic densities, in air drawn in to a car heater system. A petrol engine idling may produce up to 13 per cent. CO. Levels of CO in the air commonly exceed the industrial maximum permissible level of 100 p.p.m. Concentration appears to decrease regularly with increase in height above the ground.

620. Smoke Control Areas—Public Inquiries. Parsonage, H. (Sanitarian Lond., May 1962, vol. 70, 363-365. [L].) A guide for the public health inspector giving evidence at an inquiry.

621. On the Effect of Cement Dust on Plants. Czaja, A. T. (In German; English Summary.) (Staub, June 1962, vol. 22, 228-232. [L].) All investigations on the effects of cement dust on plants with artificial application of the dust have shown no direct influence on the plants. Investigations on plants exposed under natural conditions to dust emission in the vicinity of cement works show the formation of hard crystalline crusts which adhere to the leaves and needles. These crusts arise from cement dust which sets on the surface of the plant organs and moulds to the cells. The solution of calcium hydroxide liberated thereby penetrates through the epidermis and also through cracks into the leaves and needles and destroys the living tissue.

622. Measuring Diesel Exhaust Smoke Density. Anon. (Oil Eng., May 1962, vol. 30, 12; Thornton Res. Cent. engng. Abs., May 18, 1962, 4.) Reports the



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findings of extensive experiments to determine the best method of evaluating exhaust smoke for the purpose of legislative control in Belgium. A Hartridge Smokemeter modified by Prof. Malschaert (Ghent University) is used and a vehicle exceeding 70 Hartridge Smoke Units must be corrected. Details of the test are given.

623. Advantages of District Heating Schemes in Combating Atmospheric Pollution. Herskind, H. J. (Fuel Econ. [London] 40, 119-25 [1962].) In principal towns the added advantage of keeping air pollution at a low level is by cleaning the smoke as well as discharging it at such an altitude that it has no injurious influence. Another advantage is that the transmission of heat takes place in underground ducts which, together with the location of the central heating station, must help to a degree in relieving traffic congestion by eliminating transport of solid fuel to inhabitants and removal of the ashes. In the establishment of the many district heating plants on the continent the initial steps have been made by governmental or municipal authorities, by the power stations, the suppliers of fuel, engineering firms, or contractors. The result of all these common interests becomes apparent in the many district heating plants which have been built on the continent.

624. The Natural History, Pathology, and Treatment of Chronic Bronchitis. Garston, B. (Diseases of Chest 40, 530-8 [Nov. 1961].) Chronic bronchitis is the major cause of loss of working time and the third most important cause of death in England. It occurs in 36 per cent. of men over 30 and is four times as common in men than in women, being more common in both in the working classes. Important in the pathogenesis are atmospheric pollution and cigarette smoking, both of which lead to an excess of mucus. There is an obliterative bronchiolitis together with a varying degree of superadded infection mostly due to H. influenzae and pneumococcus. Pulmonary emphysema is the main complication of chronic bronchitis. The next effective treatment of chronic bronchitis is the abolition of cigarette smoking and of atmospheric pollution. In the well-established case, pathogens must be prevented from reaching the bronchioles by using appropriate antibiotics. A map in the text shows the degree of bronchitis mortality in England and Wales for 1950, in numbers/ million of population, as: Manchester, 1266; Newcastle-on-Tyne, 894; London, 826; and Hampshire, 512. (LC.)

625. Chronic Bronchitis in Great Britain. A National Survey Carried out by the Respiratory Diseases Study Group of the College of General Practitioners. (Brit. Med. J. [London] No. 5258, 973-9 [Oct. 14, 1961].) Under the direction of the Research Comm. of the Council of the College of General Practitioners and with help from the Ministry of Health, 92 General Practitioners working within the National Health Service conducted a survey of respiratory symptoms and disability among a randomly selected sample of men and women on their practice lists. These practices were scattered throughout Britain in both urban and rural areas. Two earlier morbidity studies, in 1958, had suggested a close relationship between air pollution and chronic bronchitis. In the current study of the 1630 individuals selected for interview and still alive or available in the practice areas, 94 per cent. or 1,569 (787 men and 782 women between the ages of 40 and 64) were seen. Respiratory histories were recorded on a standard questionnaire, and ventilatory capacity was usually assessed by the Wright peak flow meter. The prevalence of chronic bronchitis was 17 per cent. in men and 8 per cent. in women. Among men, the prevalence ranged between 6 per cent. for non-smokers and 18 per cent. for smokers; from 12 per cent. for country to 23 per cent. for city; and from 6 per cent. for social class I to 26 per cent. for class IV. The results for women were less regular. Among the conclusions it was noted that the insignificant differences in smoking habits found between town and country males were not enough to explain the urban to rural gradient in male morbidity. (L.C.)

Institute of Health Education

An organization with this title, the patron of which is Lord Cohen of Birkenhead, has been set up. It is a professional institution for those engaged in health education, and its first object is " to encourage and foster the observance of high professional standards by its members ". Information may be obtained from the Secretary, Mr. F. St. D. Rowntree, 1 Taptonville Road, Sheffield, 10.

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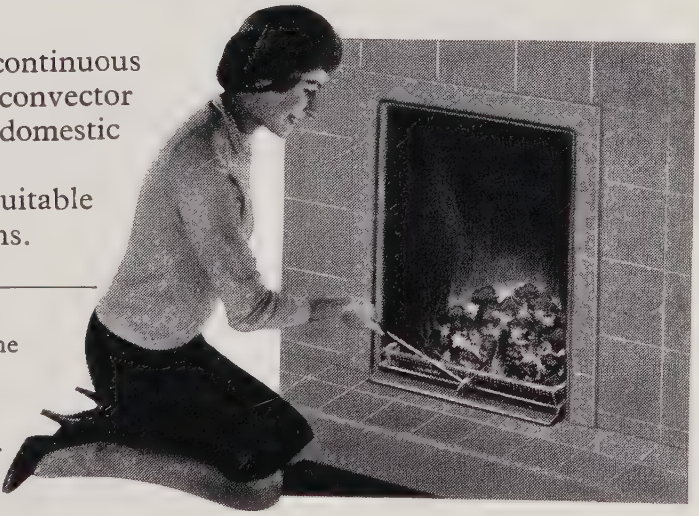

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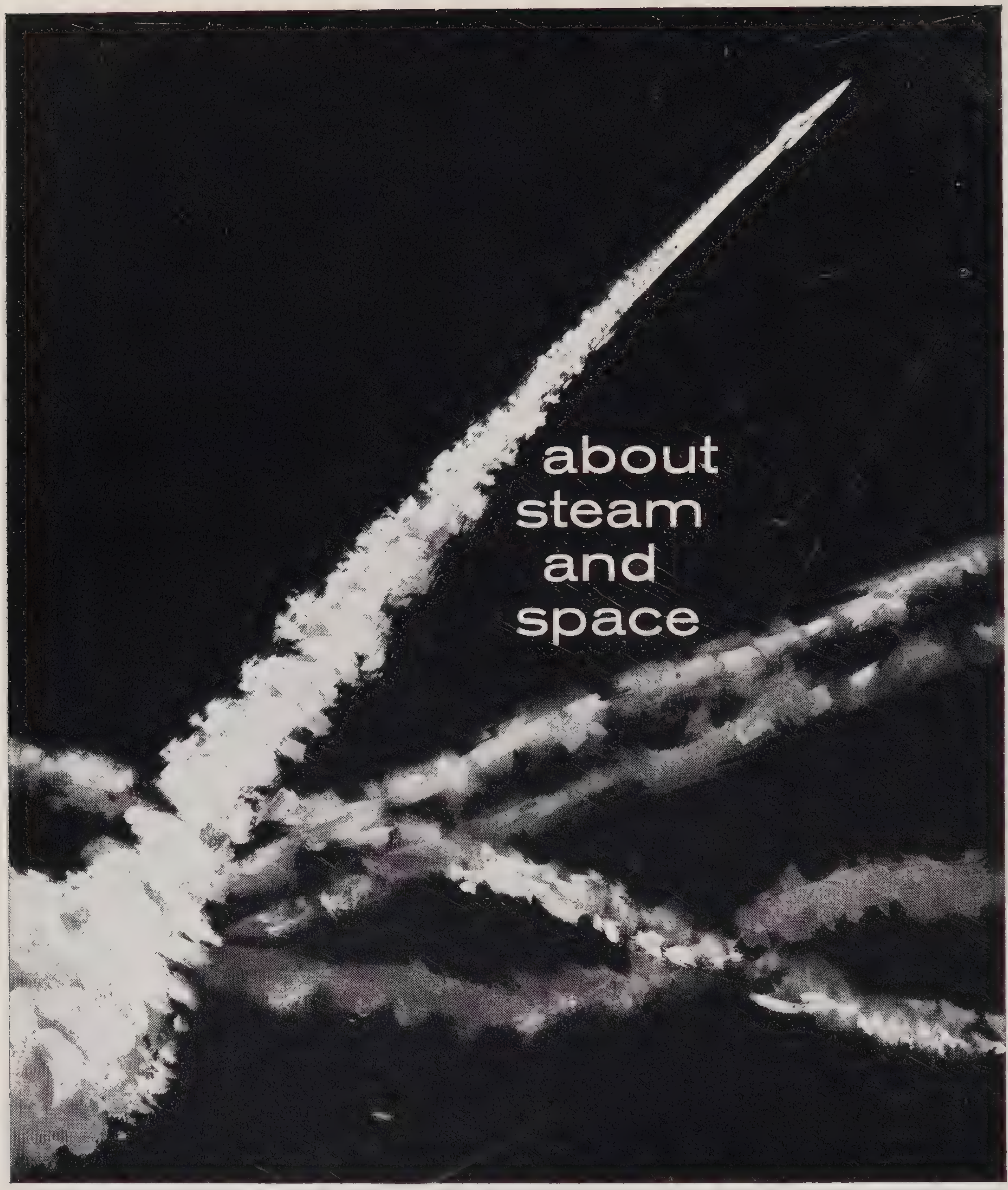

Take space. Not the interstellar variety, but Space in *your* premises. We recently installed Stone-Vapor units taking up only 274 sq. ft. in a Stockport factory. The 1,850 sq..ft. boiler house vacated was turned into a very useful machine room. These new units raised steam in 2 minutes from cold, increased output and saved on fuel costs. Greatly reduced attention saved wages. Stone-Vapor equipment is the logical choice for advanced thinking organisations, because it offers a wide range of boilers from normal pressures up to 1000 PSI at temperatures up to 1200°F. Also temperatures up to 600°F *without pressure*. Combustion is smoke-free. The claims we make for Stone-Vapor boilers are fully covered in illustrated literature, and we'll be glad to send you copies.

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JS17B

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CREDA SIMPLEX RADIATOR

(Wall Mounting model) One of the brilliant range of Creda radiators, convectors, radiant and infra-red heaters.
1 kW, thermostatically controlled.
Colours : Cream/Gold; Pink/Grey; White. **£11.7.6.**
(Inc. P.T.)

If you use solid fuel

the new Creda Grenadier electric Firelighter will light smokeless fuels in minutes, with a fan-driven jet of super-heated air.

CREDA GRENADIER FIRELIGHTER £5.17.6.
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SIMPLEX ELECTRIC CO. LTD.,
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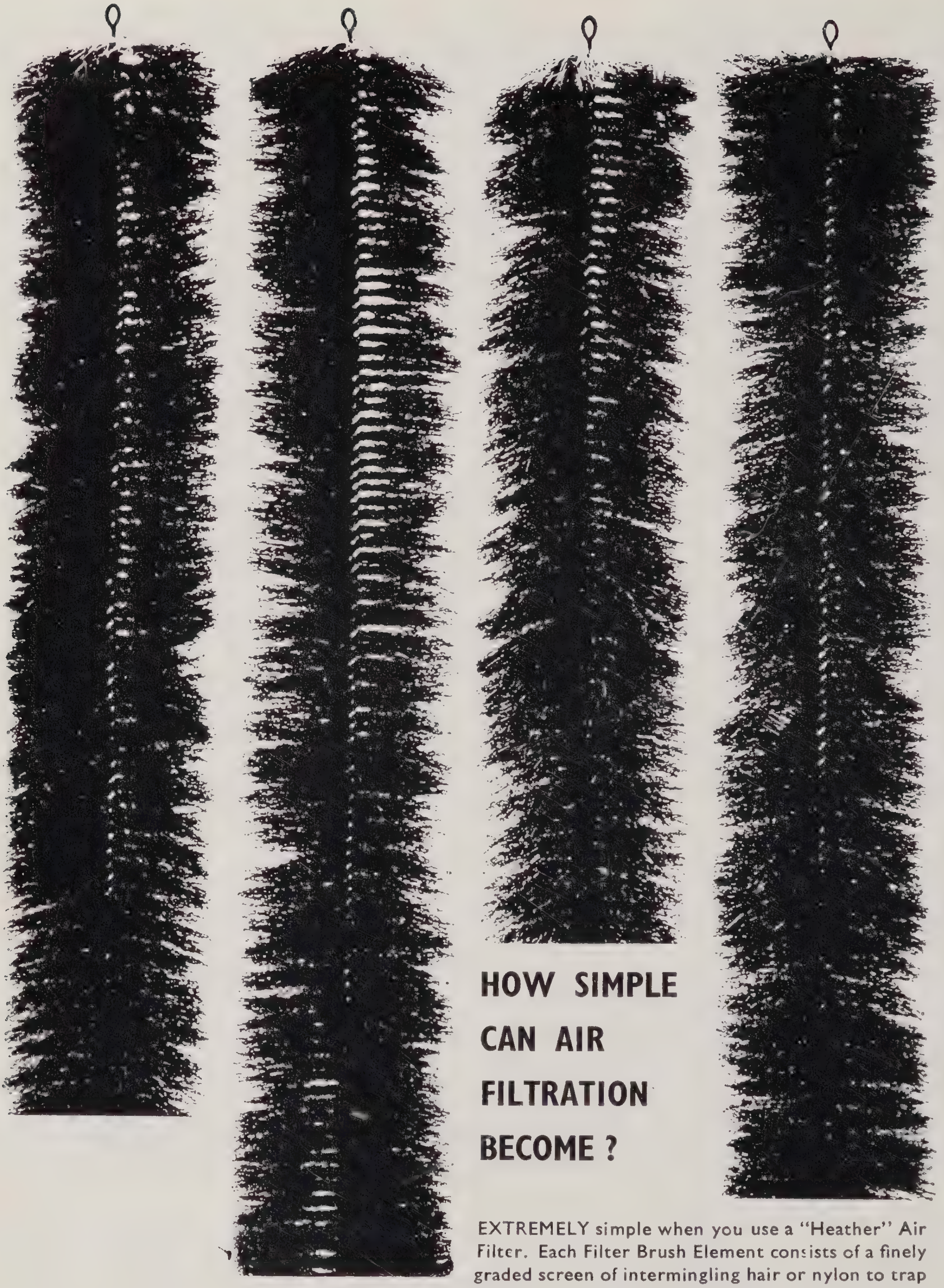

HOW SIMPLE CAN AIR FILTRATION BECOME ?

EXTREMELY simple when you use a "Heather" Air Filter. Each Filter Brush Element consists of a finely graded screen of intermingling hair or nylon to trap dust particles and impurities from the incoming air stream. "Heather" Filters need no special cleaning equipment; simply shaking, washing or vacuum cleaning restores their condition for another spell of efficient air filtration. For details of the "Heather" Filters range, write now for Catalogue No. 421.

HF HEATHER FILTERS LIMITED

H.1

7 Kendall Place, Baker Street, London, W.1. Telephone: HUNter 1801.

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MAGICAIR'S instant warmth, with the cleanliness of electricity . . . that's the advantage of the superb range of **MAGICAIR** domestic and industrial fan heaters. 'Warm air everywhere is the slogan, and you'll see **MAGICAIR** everywhere—in shops and department stores all over the country.

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Brings together for the first time, fan-forced heat and coal's comforting glow. Not just a fire, it's a furnishing!

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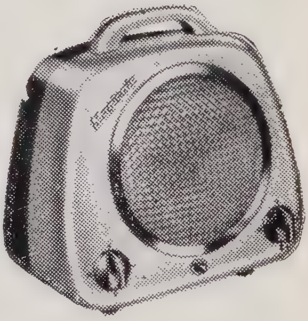

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Provides warm or cool air with just a touch to the 'Monodial' selector. Incorporates an 'Air Rota' turbo unit. Three stages of heat—two fan speeds, 2,500w.

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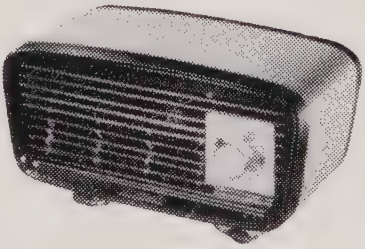

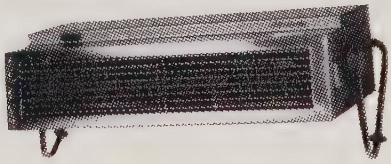

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A brilliant new design incorporating twin turbo 'Air Rota' fans. 3kW. Black heat elements £10 . 17 . 6 (no tax)

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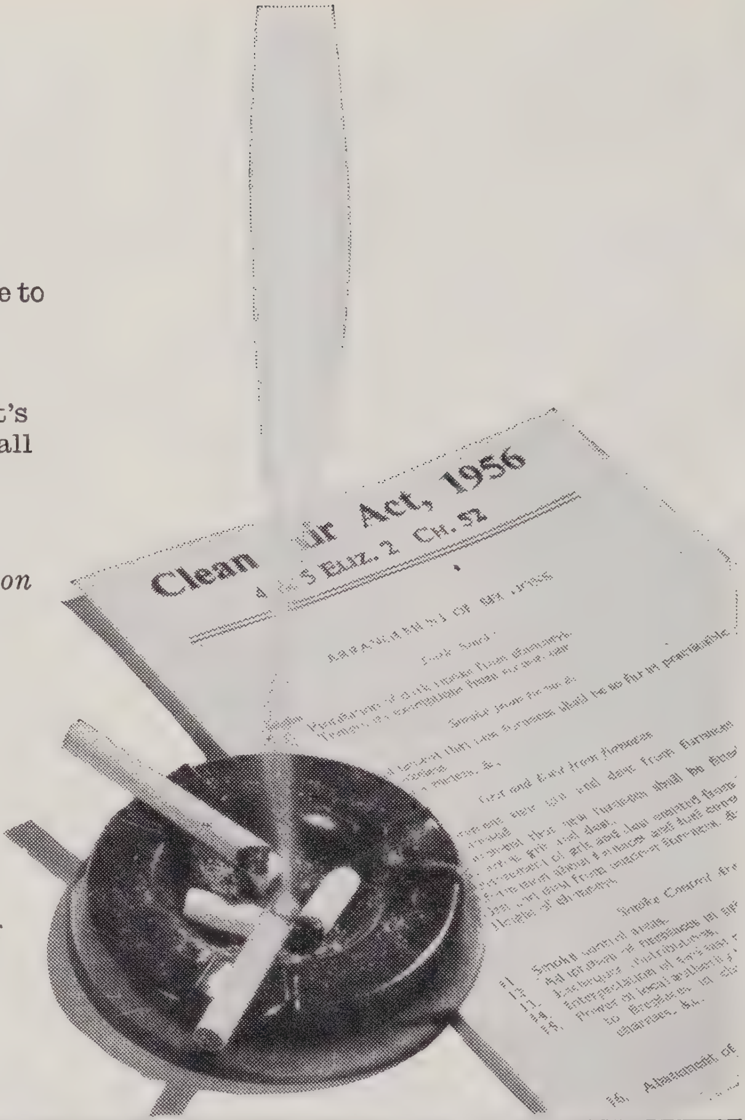
"What do you mean—everyone's getting into the Act?"

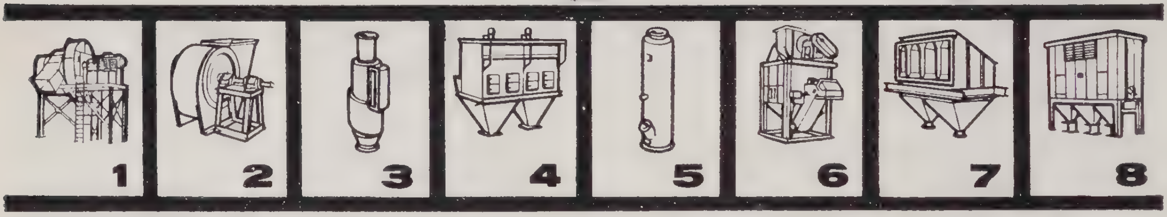
"I mean the Clean Air Act is here to stay. Every bit of combustion equipment manufactured and erected *now* must be designed to comply with the law—whether it's in a smokeless zone or not—and all existing equipment will need to comply by 1963."

"I think it's a good thing because, apart from the atmospheric pollution it's making people think—about efficient combustion. That's why I say we should get in touch with Keith Blackman. They have a complete range . . . mechanical draught fans, dust collectors, combined induced draught and grit arresting fans . . . the answer to practically every problem inherent in the Act."

"Well, they should know a thing or two. They've been at it for three quarters of a century—long before the Clean Air Act was even heard of."



Clean Air Act, 1956
4 & 5 Eliz. 2 Ch. 52



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2 Mechanical Draught Fans
3 Tornado-Cyclogal High Efficiency Cyclones
4 Tornado-Fischer Automatic Self Cleaning Filters
5 Tornado-Solivore Wet Scrubbers
6 Hydro Precipitators
7 PD-KB Tubular Collectors
8 Series TF Bag Filters

Get into the Act—with

✳ Keith Blackman

KEITH BLACKMAN LTD., DUST & FUME CONTROL DIVISION,
MILL MEAD ROAD, LONDON, N.17. TELEPHONE: TOTTENHAM 4522.

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burning smokeless fuels...

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YOUR "IDEAL"

Ideal domestic boilers—the easiest, most economical way to constant hot water. They burn coke or anthracite, need the minimum of attention and come in a variety of sizes to meet every need. All are available in easy-clean vitreous enamel. For real value for money, take the No. 0-DE for instance. It is supplied complete with side jackets and is available with grey or cream vitreous enamel finish from as little as £11-6-0 list price. Other boilers in the series include the beautifully styled, thermostatically controlled "Autocrat", illustrated above.

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BRITAIN'S LEADING MANUFACTURERS
OF DOMESTIC HEATING EQUIPMENT

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e Clean Air Act and has no delivery, storage or
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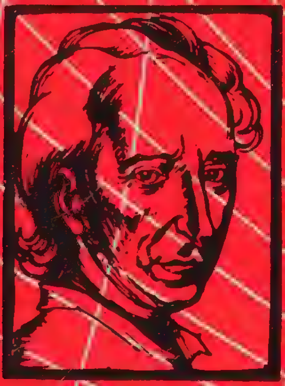
Issued by the Gas Council

SMOKELESS AIR

JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR



No. 124 ★ WINTER 1962 ★ 2s. 6d.

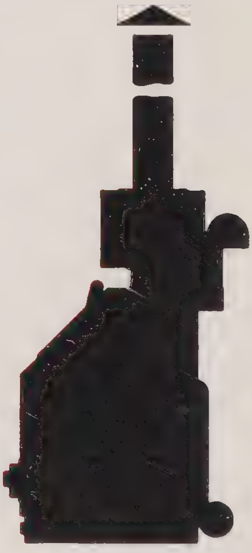
In this Issue

Presidential Address ★ Paper by J. S. Carter ★ Memorandum on Diesels ★
Holborn's Achievement ★ Octavia Hill ★ Ten Years After

WHO'S SMOKING?

EAGLE-EYED, ACTIVE INSPECTORS WILL SOON WANT TO KNOW. SEE IT'S NOT YOU! NOT *YOUR* CHIMNEYS! GET A SMOKELESS ZONE!

ZONE INCINERATORS



Now's the time! The demand for purer air makes a ZONE incinerator essential for all industries and organisations with rubbish problems. Cleanly, simply, economically, efficiently, an oil-fired ZONE (supplied in any one of 3 sizes) gobbles up rubbish at the rate of 10 cwt. to 2 tons every 8 hours – *smokelessly:* its unique secondary furnace sees to that. And a ZONE's so easily installed – just set down on concrete, chimney erected, oil and electricity connected, and away with rubbish . . . and smoke! Find out more about the most modern way to meet modern purity requirements from:

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GREEN DRAGON HOUSE, 64-70 HIGH STREET, CORYDON, SURREY
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Stop Press

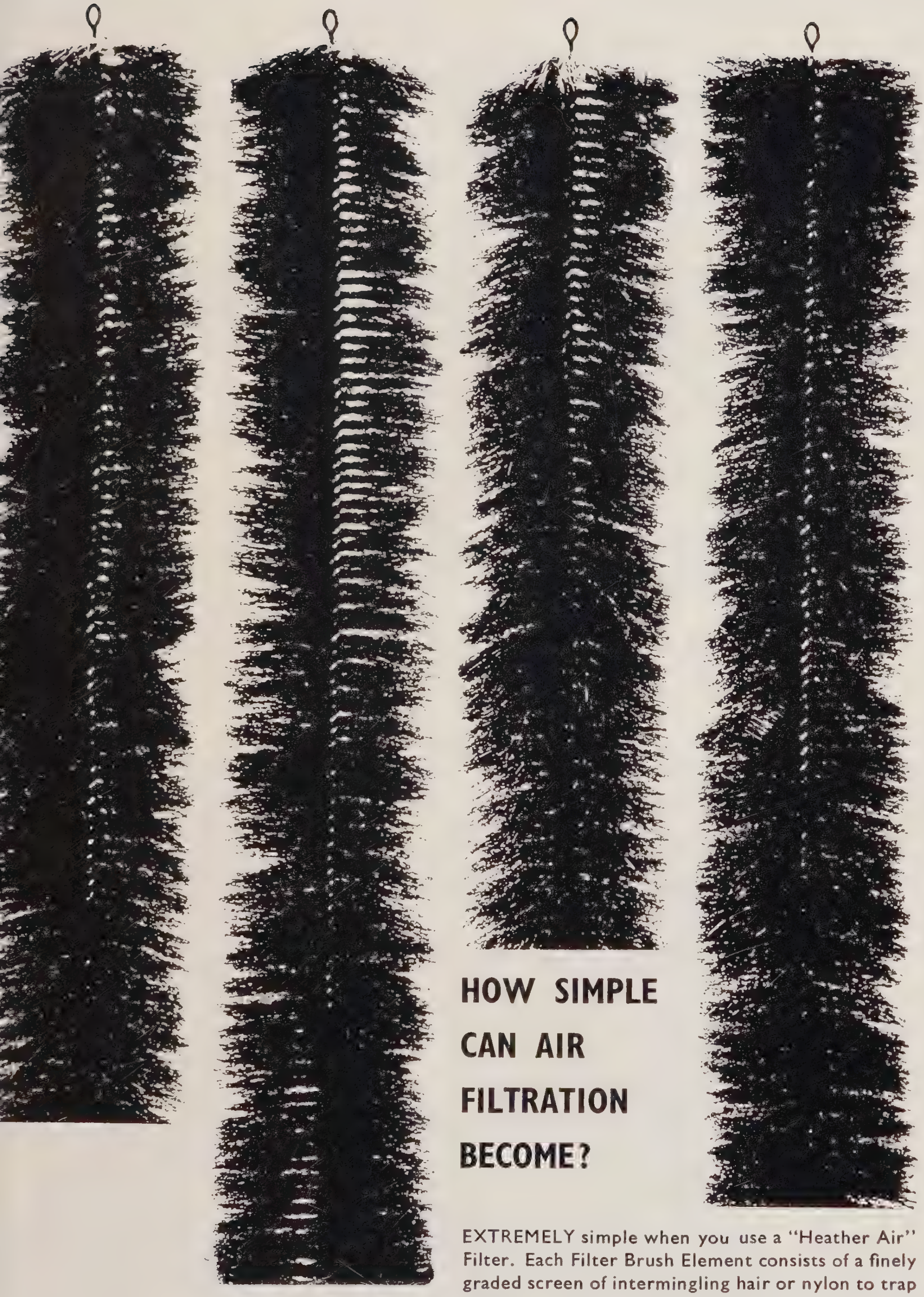
National Society for Clean Air

This issue of "Smokeless Air" went to press too early for reference to be made to the regrettable B.B.C. TV programme "Tonight" on November 26, in the course of which the Clean Air Act was attacked.

At the request of a number of members a reply to this in the form of a statement has been prepared, a copy of which we shall be pleased to send to any reader on request.

The contents of this issue, including the editorial on page 95, were written and printed before the recent smog episode. This will be fully reported in our next issue.

Field House,
Breams Buildings,
London, E.C.4.
December 6, 1962



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H.2

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The Baxi Patent Fire, the original under-floor draught fire, is officially approved for Smokeless Areas by the Domestic Appliances Council on behalf of the Minister of Power, and the Solid Smokeless Fuels Federation.

HALF A MILLION FIRES HAVE BEEN SOLD

There are Baxi fires for continuous burning, central heating, convector heating and abundant domestic hot water.
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safe, sure, certain, free from hazard—

. . . fire your
steam-raising plant with the
OLDBURY CHAIN GRATE STOKER

and be assured in every circumstance of full boiler output and labour-saving, SMOKELESS combustion."

For nearly 20 years the Oldbury Stoker—the first successful chain grate for shell type boilers—has guaranteed efficient, SMOKELESS combustion in thousands of installations using the widest range of solid fuels. And, today the Oldbury Stoker has no peer.

Industrialists seeking maximum efficiency with solid fuels are invited to send for

Publication 1618/2—**The Oldbury Stoker.**

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. . . go electric

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"I mean the Clean Air Act is here to stay. Every bit of combustion equipment manufactured and erected *now* must be designed to comply with the law—whether it's in a smokeless zone or not—and all existing equipment will need to comply by 1963."

"I think it's a good thing because, apart from the atmospheric pollution it's making people think—about efficient combustion. That's why I say we should get in touch with Keith Blackman. They have a complete range . . . mechanical draught fans, dust collectors, combined induced draught and grit arresting fans . . . the answer to practically every problem inherent in the Act."

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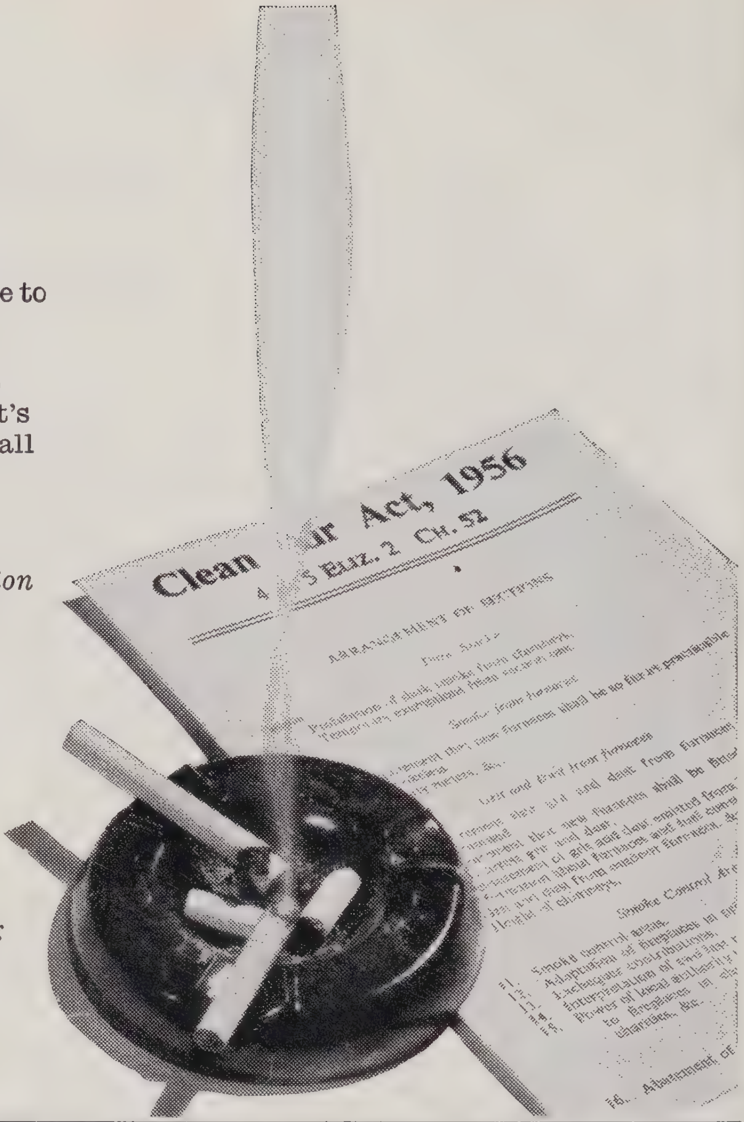

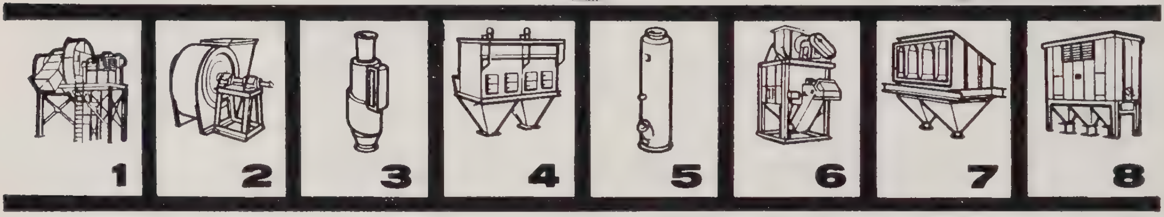

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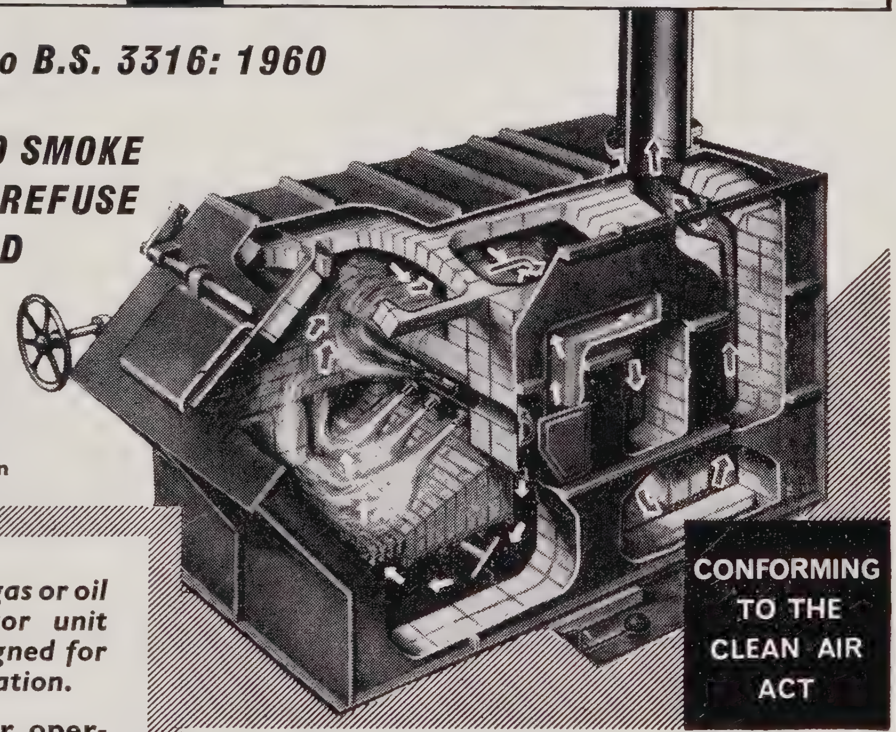

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IN.11

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everywhere

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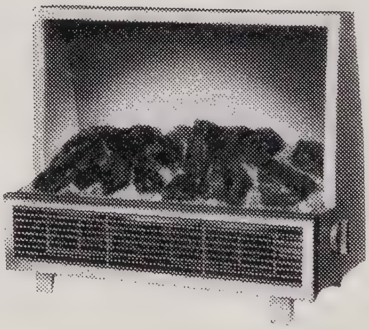
Fanfire "Twin Turbo" Coal effect fire 3 kW.

Brings together for the first time, fan-forced heat and coal's comforting glow. Not just a fire, it's a furnishing!

£18 . 19 . 6 (tax paid)



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The ever popular 3 speed fan heater. Warm and cool air, three stages of heat control and safety thermostat. 2

£9.9.0 (tax paid)

Supreme Fan Heater

Provides warm or cool air with just a touch to the 'Mono-dial' selector. Incorporates an 'Air Rola' turbo unit. Three stages of heat—two fan speeds, 2½kW

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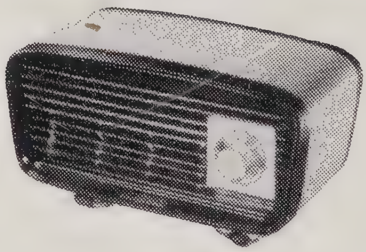

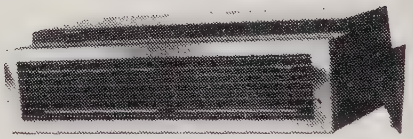

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A brilliant new design incorporating twin turbo 'Air Rola' fans. 3kW. Black heat elements £10 . 17 . 6 (no tax)

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keep clean air

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Field House, Breams Buildings, London, E.C.4 (CHAncery 5038)

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SOUTH WALES and MONMOUTHSHIRE: J. A. Church, Public Health Dept. Municipal Offices, Greyfriars Road, Cardiff (31033, Ex. 344)

MEMBERSHIP of the Society is invited and is open to individuals, local authorities, firms and other corporate bodies. Full details and membership application forms will be sent on request.

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The section of Lord Cohen of Birkenhead's Presidential Address at Harrogate, headed "The Burning of Coke", which is recorded on page 103, is being reprinted separately as a two-page leaflet suitable for broadcast distribution.

Prices, all including postage:

1s. 3d. per 12
10s. 0d. per 100
£4 0s. 0d. per 1,000

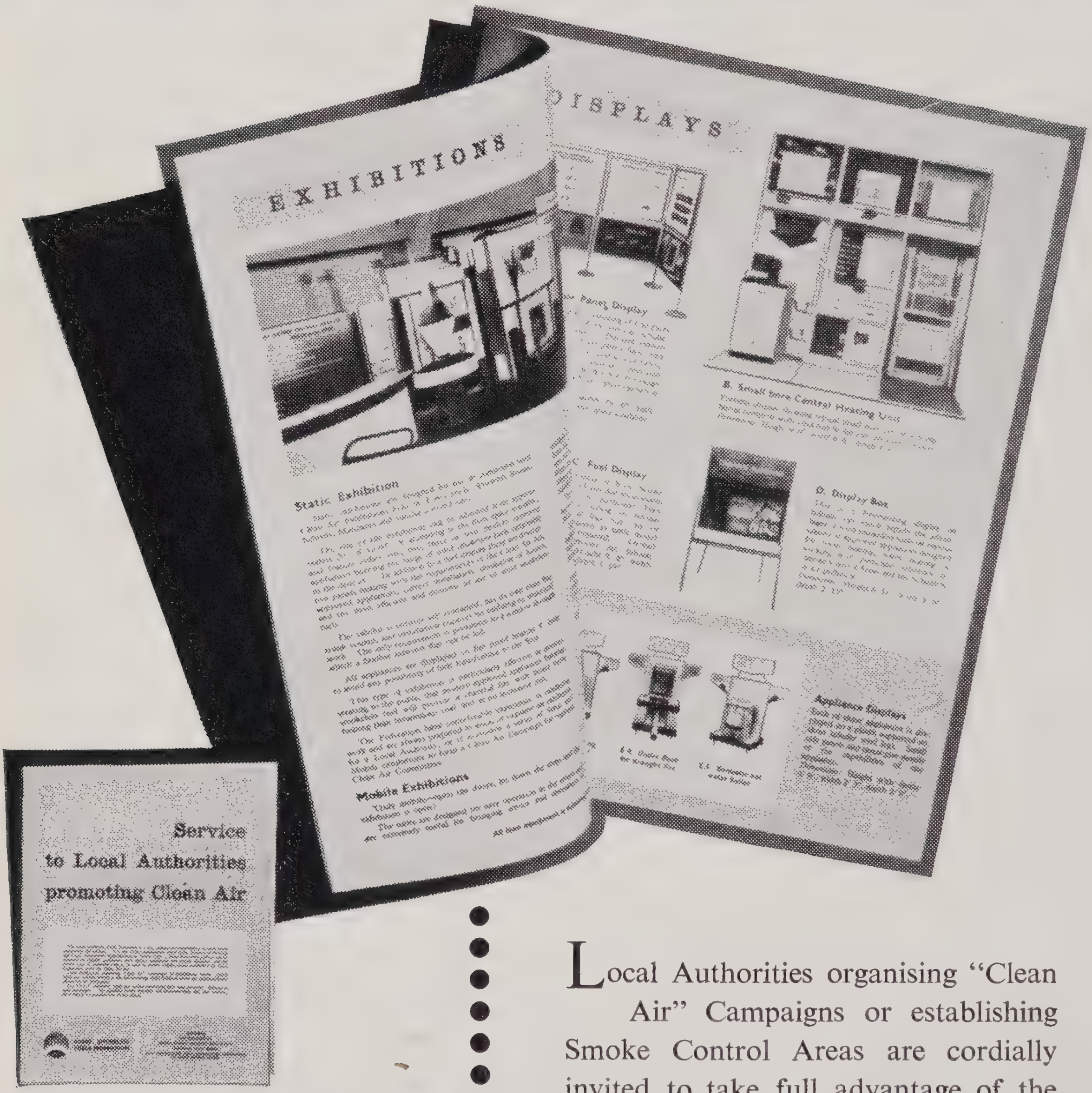
Clean Air and N.P.Y.

Please note the "rough" for a poster on this subject on page 109, where details of prices are also given. Link up your NPY and your Clean Air publicity!

Details of the Society's other posters and leaflets for distribution will be forwarded on request.

S.S.F.F. Service

to Local Authorities promoting Clean Air



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SSFF

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SOLID SMOKELESS FUELS FEDERATION
74 Grosvenor Street, London, W.1 S.43

SMOKELESS AIR

Vol. XXXIII No. 124 Winter 1962

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Ships, towers, domes, theatres and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

TEN YEARS AFTER

EXACTLY a decade ago, in December, 1952, there occurred the most momentous of all London's smogs. Because of its appalling effects on human life and health it started a chain of events and evolution of attitude that are profoundly altering the approach to the problems of air pollution. It is fitting that we should observe the end of the decade, and a brief look may be given at some of the ways in which the movement for clean air has been altered because of the great smog.

It is accepted that 4,000 people died directly as a result of the fog, and that probably an equal number died within a few weeks or months. There were even more who suffered but did not die, and some indeed who are still suffering from respiratory troubles that began during the days of the smog. It is believed by some that conditions have now so far improved that such a calamity could not recur, but although the probability may have lessened we are not so sure that, given certain meteorological conditions, disaster could not strike again. Much more progress towards clean air must be made before we can be confident that the killing smog is no more.

The disaster at once gave rise to a demand for a new inquiry into air pollution and its prevention. From this came the Beaver Committee, its outspoken report and recommendations, and finally the Clean Air Act of 1956. During the period from the end of the war to 1952 progress towards clean air had been slow but encouraging. This Society's smokeless zone principle was being steadily accepted and more and more authorities were taking powers under private Acts to establish such zones; the basis of new legislation to deal with industrial problems was taking shape; and one official report after another, on housing, fuel policy, and the like, was recognizing the need for smoke prevention. We cannot guess how well this progress would have continued during the last ten years if the smog had not happened, but it is certain that we would be far behind the position now reached.

The fact that we now possess new legislation that is a great advance on the old is of course a most important factor, but perhaps even more important is the change in opinion about clean air since 1952. This change is not yet a complete change of public opinion; it started, as these things so often do, in small but responsible and influential circles of opinion—in Parliament, Government departments, the medical and scientific world, among local authorities, in industry and parts of the Press—that is, among those who, in time, lead and guide the mass public opinion that follows. Clean air has not yet gone all the way, and much more needs to be done, but in a score of ways we can see the great advances made since 1952.

This change of attitude in responsible circles both made the Clean Air Act possible and is now ensuring its success. It is evident in particular on the industrial side, where (compared with the pre-war era) there has been a remarkable enlightenment. It is also evident in Government departments and among many—though still not all—local authorities. The industrial sections of the Act, and including the extended responsibilities of the Alkali Inspectorate, are quietly and steadily eliminating the causes of pollution from industry.

During the ten years there has been an intensification of the investigation of air pollution, its nature and behaviour, and it has been found that the domestic chimney is a much greater danger than had previously been believed. The need for the elimination of domestic smoke has been shown to be even more urgent than the Beaver Committee had stated. Towards this objective progress is also being made, but at a rate far less than is possible. That the smokeless zone, or smoke control area, principle is sound has by now been amply proved, and it is disappointing that, taking the country as a whole, we should still be merely creeping towards clean air. But there are exceptions, and we venture to prophesy that when the first completely smokefree towns or boroughs have been attained progress will accelerate.

In other ways the pattern of the problem has changed during the decade. Thus the question of road vehicle pollution has come much more to the fore, and there is to be discerned a much sharper reaction than there used to be to any form of pollution—from industrial dusts, fumes and smells, and even garden bonfires. Is it that public awareness of the existence of a Clean Air Act, and of the gradual coming of smoke control areas, is establishing clean air as a part of everyday life and affairs? And as a result, aided by other trends, are our standards of environmental amenity and cleanliness, for so long so very low, at last beginning to rise? If this is so, as we believe it is, progress during the coming years may well be faster and more exciting than it has been during the decade now ending.

The Ayes Had It

The motion to increase the minimum rates of subscription submitted at the Society's extraordinary general meeting at Harrogate on October 9 was passed almost unanimously, only two votes being against. This was in effect a vote of confidence in the Executive Council and its belief that the Society's income must be increased if, in the face of rising costs, it is to maintain, and try to extend, our activities. The new subscription revenue will meet the need in part, but it will continue to be necessary to seek new members and generous donations.

There have been very few indications that members might be lost because of the increased rates, and a first reaction was that one local authority, which has hitherto been only an Associate, at three guineas, decided to become a full Member, paying the new rate for its population, fifteen guineas, and to start this even before the new rates begin in 1963.

A Lead from Hampstead

The movement for consumer organization, which means consumer education and guidance, is spreading from the national to the local level, and there are now a number of such local organizations. Much of their work must be of a pioneering and experimental nature, and in different communities may well take different forms. We would like to congratulate one of the first of these bodies, the Hampstead Consumers' Group, on the first number of their publication *Focus*. To begin with, as fellow-consumers, we like the *way* they have tackled their first important subject. Secondly, we like the subject—solid smokeless fuels.

Hampstead has planned 12 smoke control areas, and aims to make the whole borough smokeless by 1967. Smokeless fuel is therefore an important matter for every household. The publication explains what smoke control means, what solid fuels are smokeless, and the different purposes for which they can be used. But the important, the local, information is on the fuel merchants in the area, the services they offer, their delivery schedules, the minimum orders they will accept, whether they operate a trolley service, and the prices of the different fuels. A table shows the frequency of delivery in the different parts of the borough, as offered by the various merchants. There is also a section of complaints and how to make them. Also of importance is a questionnaire which members are asked to complete and return in due course, relating to the orders placed during the present heating season—date of order, amount, fuel, delivery date and price charged.

Such helpful, practical guidance to those turning over to smokeless fuels can be invaluable in aiding a smooth transition to smoke control, and it is something that can be done only by an independent local organization. It should also help to promote better service from the fuel merchants and to help them in turn by removing the misunderstandings and confusions that lead to complaints. The Group is starting a community service that we trust will be widely followed, and we wish it every success.

The Gimmick

It needs a sociologist, a psychologist, or some such student of the human race, to study the reasons behind the remarkable interest that was taken, in the exhibition at Harrogate, in some tins of fresh air. For the benefit of those who know nothing of this new commodity we repeat: tins of fresh air. It must be explained that it is possible, in London and perhaps elsewhere, to purchase small sealed tins or cans, with a nicely coloured label showing Ann Hathaway's cottage and a legend that states that it contains fresh English country air. We understand that it sells at half-a-crown, and apparently is eagerly bought by American and other tourists. One of these cans, keeping up the joke, was shown on the Society's own stand in the exhibition, with the admonition that this was not the best way of securing clean air.

But the darn thing seemed to attract more attention than anything else, and was given little paragraphs in the newspapers. One (guess which) even published a large picture of an attractive young lady from another stand throwing up and catching a tin, thereby giving us more coverage in this particular paper than for all the rest of the conference put together. And finally, to cap all, the Society's Director was induced to examine one of the tins, in front of a BBC television camera, while he answered questions about the prospects of a new industry growing for the mass production of canned fresh air, and whether in the future this might even be delivered every morning with the milk. An interview of this kind is what is known as an occupational hazard.

(*Picture on page* 126)

Put out the Flags

The Women's Advisory Council on Solid Fuel had a pleasant idea of celebrating the inclusion of their offices and showroom in a smoke control area by throwing a little party. It was a representative gathering of ministerial, municipal, fuel and other people, including the Mayoress of the authority concerned, Westminster. It was an excellent reason for a celebration—why should we not give three cheers when new smoke control areas come into being?

Diesel Item

A hitherto unsuspected reason for road vehicle smoke is provided by a reader who writes to tell us that on the back of an offending lorry he read the warning:

SMOKE SIGNALS
RED INDIAN DRIVER

We are wondering if this applies also to some London taxis, also noted for their smoke signals. It would give point to the line: "None but the Brave deserves the Fare."

Diesel Smoke

New Memorandum by the Society

The following Memorandum, prepared by the Technical Committee and approved by the Executive Council, has been submitted to the Minister of Transport

1. The Technical Committee of the National Society for Clean Air has been considering further the problem of excessive smoke and fumes from diesel vehicles, and has noted with satisfaction the spot checks that have been carried out recently by the Minister's Examiners. These checks are on the lines of the control suggested by the Society in the statement submitted in October 1961, and it is hoped that they are in the nature of trials for more regular and extensive observations.

2. Its further discussions has led the Committee to the conclusion that excessive smoke emission from diesel engines can be prevented if the metered quantity of fuel injected does not exceed that which can be burned completely in the engine concerned. Fuel injection pumps are all fitted with an adjustable device, the fuel stop, which is provided for limiting the maximum quantity of fuel delivered: Thus, with a properly set fuel stop, and provided the fuel pump, the fuel injectors and the engine itself are properly maintained in good order, excessive smoke cannot be emitted under any conditions of loading the engine or vehicle.

The principle of limiting the amount of fuel to the amount that can be completely consumed is already recognized in the Regulation* that prevents the excess fuel starting device, which overrides the fuel stop, from being operated when the vehicle is moving. It is a logical step to require this control to be extended so that at all times the quantity of fuel injected is not in excess of the amount that can be completely burned.

As the means for this are available in the normal fuel stop that prevents an excessive feed of fuel, it is suggested that it should be required, by Regulation, that the fuel stop should be set, before sale, by the engine manufacturers, at a point below that at which visible smoke can occur. It is then suggested that the fuel stop setting should be fixed or sealed, and that it should be an offence under the Regulation for any person other than one authorized by the Ministry to remove this seal or to alter the setting.

In Parliament

QUESTION ON DIESELS

In the House of Commons on November 7, 1962:

Mr. G. M. Thomson asked the Minister of Transport if he will state, in connection with the regulations making it an offence for a driver to produce excessive diesel smoke, how many lorries have been taken out of service at the check points during the most recent convenient period, and how many others have been warned about bringing their engines within the regulation.

Mr. Marples: 83,000 diesel lorries were observed in three special nationwide surveys this summer, of which 9,800 were emitting black smoke. 132 were taken out of service immediately and 3,900 were threatened with prohibition unless they later satisfied a second test. In addition, 4,000 warning letters were sent.

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* The Motor Vehicles (Construction and Use) (Amendment) Regulations 1961. S.I.1313, 1961.

Presidential Address

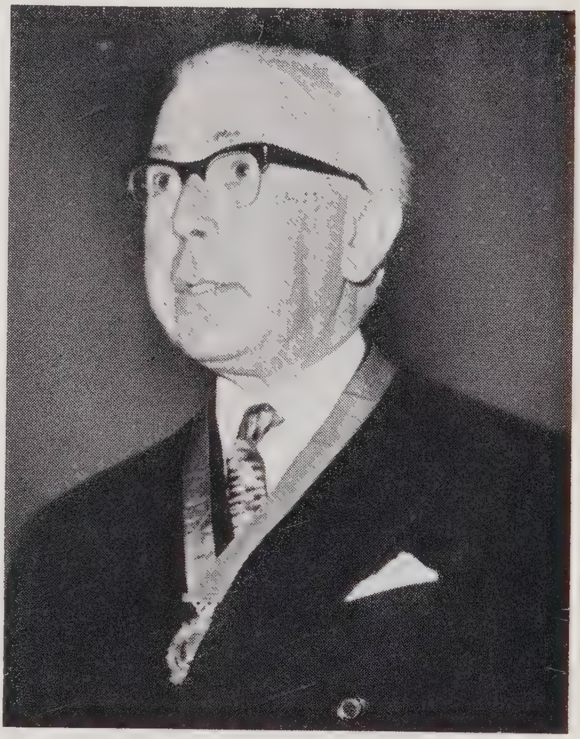
by

The Rt. Hon. Lord Cohen, P.R.S.H., M.D., D.Sc., LL.D., F.R.C.P.

I AM once again privileged to deliver the Presidential Address at the Annual Conference of our Society. Boswell recalls that when Dr. Johnson was told of a gentleman who married very shortly after his wife's death he observed, " It is the triumph of hope over experience ". A second Presidential Address might evoke similar sentiments in your minds, but the fault, if so there be, lies primarily with you and on you must rest the consequences.

When the Conference met in Harrogate two years ago it was privileged to hear an inspiring address from Sir Keith Joseph, then Parliamentary Secretary to the Ministry of Housing and Local Government. Recent Cabinet changes have placed the responsibility for that Department in his hands, and we offer him our warm congratulations and good wishes in so high an office, to which he brings a brilliant mind and outstanding administrative gifts unfettered by the shackles of precedent, an irresistible charm and an urge to contribute to the welfare of this country. Of the problems which confront his Department the hazards and discomforts of air pollution are in this last respect not the least significant.

Last year I drew attention to the chronic poisoning of the air we breathe by dozens of chemical processes characteristic of an advancing civilization, which gives rise often to minor illnesses over the years, but which nevertheless inexorably cripples and kills in the end.[1] Nowadays bronchitis accounts for approximately one-tenth of all illnesses diagnosed by general practitioners and more of a practitioner's consultations and visits are concerned with bronchitis than with any other disease.



The President—taken during the reading of his address

The latest available mortality statistics, those for 1960, show that of a total of 526,268 deaths in England and Wales over 50,000 were due to bronchitis and pneumonia[3]; the death rate from pneumonia has not improved in recent years despite the availability of effective drugs because so often pneumonia is the terminal episode in a longstanding chronic bronchitis.

Cancer of the lungs pursues its baneful progress; its death rate increases by about a thousand a year. In 1960 this disease claimed 22,000 victims—over three times as many deaths as those from motor accidents.

Chronic bronchitis is rightly called " the English disease ", for most of the statistical evidence on which the connection between air pollution and this disease is based derives from experience in this country. Yet experience elsewhere supports this association. Particularly striking has been the experience of American military personnel stationed near Yokohama, amongst whom a chronic progressive atypical asthma has become virtually endemic. No infective agent has been found and the relief of symptoms when the victims are moved out of the area, the heavy industry in the neighbourhood, and the amount of smog make it virtually certain that this atypical asthma is a response to a polluted atmosphere.[4] In Belgrade, detailed comparisons of morbidity from typical asthma in different areas have also shown a correlation with variations in atmospheric pollution.[5]

There is evidence also that unexpectedly heavy smog can trigger off asthmatic attacks. A recent report from Australia tells of hundreds of acute asthmatic attacks occurring within a very brief spell as a result of a temperature inversion which prevented the usual dissipation of polluted air; and similar correlations have recently been observed in San Francisco between the sporadic air pollution and the exacerbation of symptoms in chronic bronchitis and emphysema.[6]

In my address last year I touched briefly on the relationship between cigarette smoking and cancer of the lung which originates in the bronchial tubes. Since then the Royal College of Physicians Report on *Smoking and Cancer* has been published. This is a masterly marshalling of the available data pointing to the irresistible conclusion that no prudent person will continue, without weighing the risks, to be an excessive cigarette smoker. The Report did not claim that cigarette smoking was the sole causative factor in lung cancer; indeed, it acknowledged the rôle which atmospheric pollution might play and the College has established a committee to investigate this.

Studies from all parts of the world show that air pollution plays a substantial rôle in the etiology of lung cancer. Comparisons of the incidence of this disease in town and country when they have been adjusted for smoking habits show a significant excess of lung cancer deaths in the urban population over the rural population at every grade of smoking habits. Every study supports this general conclusion, although the degree of variation between urban and rural populations differs considerably. The 33rd Annual Report of The British Empire Cancer Campaign (1955) reports that among non-smokers the urban/rural ratio for lung cancer deaths in that year was about 9 to 1. The larger study reported by Hammond and Horn[7] revealed a less spectacular but still significant difference. In a group of about 180,000 white men aged 50–70 and followed up for a period of 44 months, the incidence rate was 52 per hundred thousand for city dwellers, as compared with 39 per hundred thousand for those living in rural areas. However, since these groups contained both smokers and non-smokers, the findings are perhaps not strictly comparable with those of the report of the British Empire Cancer Campaign.

Moreover, the problem of definition clearly disturbs extensive studies. The person living in the country but near a main road and not far distant from a large factory may be living in a more " urban " environment, as far as the air he breathes is concerned, than many city dwellers. Hence the studies localized to precisely defined and relatively small areas are of great interest and Patno's work[8] which some years ago compared the cancer incidence in sixteen districts of Pittsburgh and showed that lung cancer prevailed in the central business and industrial areas, points the way to a type of study that might usefully be made in large cities. Mills[9] in an interesting survey of lung cancer deaths in greater Cincinnati found that there were highly significant correlations between deaths from lung cancer and three other variables, namely, cigarette smoking, urban residence, and the number of miles driven annually in urban traffic. In a recent analysis of his findings he asserts that " in general, urban residents exposed in urban traffic for over 12,000 miles per year, exhibit over twice the lung cancer incidence rates of those with lesser urban driving mileage". All the available evidence supports his suspicion that this differential has increased in the past few years.

Following the tragedy of the smog in the greater London area of December, 1952 which is estimated to have caused some 4,000 deaths from bronchitis and pneumonia, the Medical Research Council turned its attention to the problem of urban air pollution, and in its recent Annual Report[10] it devotes for the first time a special section to this aspect of its work. In this are reported the results of experimental, clinical and statistical investigations of considerable interest and promise. But there can be no early clear-cut answer to many of the problems of the relation between atmospheric pollution and respiratory disease, and particularly to that of establishing a connection between specific pollutants and specific disease processes. Firstly, one cannot experiment on man, and too often he shows inherited variations in response to different environmental factors; secondly, the time lag of such effects is very largely unknown; thirdly, social conditions and atmospheric pollution are continually changing; and fourthly, as Schepers[11] has succinctly stated " about 3,000 chemical particles have been identified which can be dispersed in air, less than 10 per cent of these we know something about, and less than 1 per cent of that which we know is relevant."

But we cannot await complete understanding before applying the crude but well established knowledge that we already possess. We know that air pollution is a severe hazard to health, although we cannot measure the degree of its severity, nor can we explain the mechanisms involved. Consequently, our aim must be the maximum possible elimination of air pollution. The medical profession has in recent years increasingly recognized the harmful effects of air contaminants, and I can promise on their behalf wholehearted support for the persistent efforts of this Society to prevent air pollution.

The National Productivity Year

I turn now to another though by no means unrelated topic. You will know that our Publicity Committee recommended, and the Council agreed, that we should associate ourselves with the National Productivity Year opening in November, and I have been honoured as President of the Society to accept the office of Vice-Patron of the Year. It is, therefore, appropriate that I should refer briefly to the economic aspects of air pollution and its effects on productivity. It is not possible immediately to translate all these effects into economic terms. Ill health is one example of the difficulty, and offensive odours indeed stenches are another. In some cases estimation of damage is accurate, in others only approximate. If the damage is " total," *e.g.* crops rendered unsaleable, or flowers destroyed, the loss can easily be calculated. But if " partial," *e.g.* corrosion of metals, soiling of curtains, blackening of paint, it may be controlled or prevented, though in economic terms we must clearly balance the cost of the damage due to pollution (which is rarely accurately ascertainable) against the cost of measures to combat or eliminate pollution (which are more accurately ascertainable).

I have earlier discussed those illnesses in which air pollution plays a part, and which result in a direct loss of manpower to national productivity. There are, however, many other sources of loss. Livestock and crops may suffer seriously in polluted areas. There may be corrosion of various materials, especially stone and metals, and their protective coverings, depreciation of objects of merchandise exposed to pollution, a need for more frequent repair and renovation of property, such as buildings, metal

The Royal Hall at Harrogate, during the opening conference sessions

structures and paintwork, and also for extra washing and laundry. French statistics provide interesting information. The city dwellers give on an average 50 per cent more clothing to be washed each week than does the rural inhabitant, and it is estimated that the atmosphere in urban areas decreases the life of garments by 1/20th. A coat of paint or paper lasts six years in the country and four years in the town. Builders say that zinc work which used to last for thirty years has now, when exposed to severely polluted atmospheres, to be renewed in four to five years.[12]

Another source of loss is the unburnt residue in chimneys, motors and various engines, which contributes to the general pollution, an example of the waste of mining productivity by the loss of fuel in making smoke. Researches by The British Coal Utilisation Research Association since the publication of the Beaver Report,[13] show that up to 5 per cent of the coal burnt in the open domestic fire is lost in the form of smoke, and this means an annual loss of coal of up to 1,500,000 tons.

Again there is loss of productivity during smoke-fog or smog conditions due to the intensification of the normal harmful effects; at these times there is also interference with all forms of transport in so far as natural fog is made worse or lasts longer because of its smoke content, and there is the wasted electricity due to premature twilight caused by smoke. There is, moreover, the cost in money and manpower directly incurred by the adoption of technical measures for the suppression or reduction of smoke or emission from factories; the increase in cost of electric power due to dust removal and other treatments of smoke from power or nuclear stations; the expenditure in connection with the administrative organization of pollution control; and the costs of medical, agricultural, chemical and physicochemical research which aims at working out techniques for the measurement of pollution, investigating the ways in which pollution affects persons, animals, plants and materials, and studying appliances or installations for the reduction or suppression of various dusts and emanations.

Appendix II of the final Report of The Beaver Committee[13] discusses in detail the economic cost of air pollution, and estimates that the monetary cost was in 1954 at least £250 million a a year, plus £25 to £50 million as the value of the coal lost in producing smoke. Sir Hugh and other members of the Committee have since stated that this estimate was too conservative, and their view is supported by many subsequent publications dealing with the economics of air pollution. This is a cost which is borne by the individual, by industry, by Local Authorities and others. It is fitting that, as National Productivity Year opens, attention should again be drawn to the cost of air pollution and its effect on national productivity through the tying up of manpower, of capital, of materials for repair and renovation, and thus diverting these from more fruitful purposes in the social services, commerce, industry and the professions.

The Burning of Coke

One aspect of the problem of smoke control to which my attention has been directed in the past few months is the use of coke as a smokeless fuel. It is commonly believed that open coke fires give off fumes which are injurious to health, yet if the rapid expansion of smoke control areas is to be facilitated, any doubts about the use of gas coke, which is the cheapest smokeless solid fuel in ample supply for open fires, must be resolved. It appeared to me that both from the medical and the fuel aspects the question should be capable of a firm answer. A careful assessment of studies reported in the literature, consultations with experts, and visiting installations in private homes (since it must never be forgotten that nearly half of all the smoke in the air comes from domestic chimneys, and the proportion is indeed greater in areas where houses predominate) have resolved all my doubts, and I am especially indebted to Dr. P. J. Lawther of the M.R.C. Air Pollution Unit and Dr. A. E. Martin of the Ministry of Health; and to Professor Semple and Mr. Wattleworth of the Health Department, Liverpool, who arranged my visits. I was indeed surprised to find that there were so few complaints; it might however be a good plan to make a survey of the prevalence and nature of complaints based on alleged adverse medical effects of coke fires, and to investigate any which appear to have a rational basis.

The facts, which others have confirmed, derive essentially from the work of Crumley and Fletcher.[14] It is well known that coke fires emit neither smoke nor tar whereas coal emits both, and it is the tarry smoke from coal fires which is the main source of the aromatic hydrocarbons which are found in town air; some of these are known to give rise to experimental cancers.

No such smoke arises from a coke fire, yet one of the objections raised to coke is that it " gives off fumes ", by which is presumably meant sulphur dioxide (SO_2) because of the smell which is discernible under adverse conditions. Yet flue gases from coal show an SO_2 concentration in the early stages of combustion several times greater than the amount of the SO_2 given off from a coke fire. Why then the objection to coke on account of smell? The total emissions of SO_2 from equal weights of coal and coke when burnt in a fire are the same. It is probably because the smell of SO_2 from coal is masked by the pungent smoke if there is a down draught. Moreover, Crumley and Fletcher, using an openable stove with the fire-doors open, found that in the early phase of combustion of a coal fire there is emitted up to 100 p.p.m. of sulphuretted hydrogen (H_2S)—a most offensive smelling gas—whereas coke emits only a trace.

It has been said that the risk of carbon monoxide (CO) poisoning from a coke fire is not a negligible hazard. Yet the flue fumes from both coke and coal show similar concentrations of CO (0·1 per cent to 0·25 per cent). This belief probably derives from coke being more commonly used in free-standing closed stoves which might have leaky flues, but on open fires coke presents no greater hazard than coal.

A coke fire burns at a higher temperature and gives out greater heat, more uniformly. But the higher temperature of combustion means that more of the sulphur is oxidized to sulphur tri-oxide (SO_3). A brightly burning coal fire emits only half the quantity of SO_3 compared with a coke fire; indeed, a smoking coal fire emits no SO_3. The SO_3 forms with the water vapour of the atmosphere small droplets of sulphuric acid but this emission is very small, and in none of the houses visited, including one in which the occupant had been retired from work because of chronic bronchitis, was there any complaint of irritant fumes.

There seem to be two sources from which popular bias against coke fires is derived. Firstly, from the experience of the emissions from coke used in closed domestic boilers; the flues of these boilers can be inadequate, the lids can be removed, and the escape of gases into the air is therefore comparatively easy and commonly occurs. Secondly, since the amounts and concentrations of the gases which arise in the combustion of any fuel vary not only with the fuel but also with the different combustion appliances, and the conditions under which the fuel is burned, it is essential that these should be satisfactory. If unsatisfactory, coke will be regarded as an inferior fuel; yet coke is not only as satisfactory as coal, but it is also more economical, and since it does not carry the long-term hazards and economic burdens of atmospheric pollution due to coal, it is for domestic heating the more satisfactory.

The dissemination of this knowledge is a problem which local authorities face and must solve. They must ensure not only the provision of appliances and the necessary conversions for smokeless combustion but must also see that these appliances are properly used. To this end, written and oral instructions are not enough. Personal demonstrations must be arranged, recently installed appliances must be inspected to ensure that they are working satisfactorily, and an adequate supply of smokeless fuel should be available at the dealers.

Some local authorities have provided demonstration houses in which the various forms of smokeless combustion can be seen, and their appropriate use and indications can be explained.

Smoke Control Area Grants

There is one aspect of this problem on which I cannot claim expert knowledge. I refer to it because it is frequently raised by Medical Officers of Health with whom I have discussed the need for more rapid implementation of the Clean Air Act. All seem agreed that there is considerable irritation and frustration arising from a lack of beneficial incentives to owners and occupiers who have voluntarily converted their houses to smokeless combustion. These people have acted in advance of official approval, many from idealistic motives based on improvement of their environment, and some for practical reasons connected with timing alterations to their houses in one operation to avoid double inconvenience. There are two groups of these good citizens; firstly, there are those who live in declared smokeless areas where the appliances have been installed prior to confirmation or without written permission; and secondly, there are those houses situated in the fringe areas of smokeless zones whose occupiers have been moved by propaganda to wish to change to smokeless combustion at the earliest possible moment.

If it were possible to recognize by a grant the co-operation and goodwill of such householders, it would speed up smoke abatement in advance of the smoke abatement programme. In Liverpool already 800 cases have been reported of people who have spent sums varying from £10 to £100 and who have received no grants, whilst their neighbours, who have waited until the change is compulsory, have received 70 per cent of the cost. The number of aggrieved people is constantly increasing in the more progressive local authority areas, and yet these authorities cannot reasonably contemplate a discretionary payment because of the large sum of money which is potentially involved, for should the Local Authority consider paying these claims, the full amount would have to be borne by the rates without Exchequer Grant Aid, as such claims do not qualify under the Clean Air Act, 1956.

No one familiar with the problem will underrate the Minister's difficulties in defining criteria which will ensure appropriate control, but these should not prove insuperable. For example, practical criteria might include firstly the production of receipts of recent origin; secondly, the signing of an agreement undertaking to obey certain regulations; and thirdly, the restriction of payment to people in Smoke Control Areas or within a specified distance of declared Smoke Control Areas. It is true that a short interval may well elapse before the occupiers burn solid smokeless fuel, but many would convert to gas or electricity immediately if the grant were available.

As you well know, the House Purchasing and Housing Act, 1959, allows grant aid for improvement to houses. The " Standard Grant " scheme allows as a right the cost of up to a maximum of £155 for installing five basic improvements, namely, a bath or shower, a wash-hand basin, a water-closet, hot-water system, and a food store; if it were possible to add to this list ranking for Grant Aid, the phrase " the installation of an approved smokeless appliance ", the work of conversion in advance of Smoke Control Orders would undoubtedly be expedited.

The " Discretionary Grant " scheme allows for conversion of houses into flats up to a maximum grant of £400. Here again it would be advantageous if under this scheme the Local Authority were to insist on approved appliances being installed as one of the twelve requirements. There is a clause under this scheme which states that a house should be provided with adequate means of supplying hot water for domestic purposes. The Local Authority should, therefore, take every opportunity of insisting upon the installation under this scheme of approved smokeless appliances.

I have dealt with but a few of the topics of current interest which must be exercising all our minds, and there are several others which would have merited public reference had time allowed. But I have already spent my allotted time, and even your President cannot " bid time return ". May I, therefore, in concluding this address, firstly, thank you once again for the signal honour of being your President for the past two years.

No one who shares with Disraeli the belief that, " The health of the people is really the foundation upon which their happiness and all their power as a state depend ", can fail to be proud of leading such a Society in the work which it has undertaken. Slowly, all too slowly, the implementation of the Clean Air Act continues. Our tasks are twofold; firstly, we must educate the public and those who represent them in Government to realize the vast damage and enormous cost of air pollution; and secondly, we must prod the Government repeatedly to greater effort and generosity. For the Clean Air Act must be accepted not simply as a statutory responsibility, but as a challenge and a great opportunity.

A year ago Lord Hailsham, the Minister for Science, ventured to prophesy that by 1984 " the air even in industrial areas will be clear of smoke and dirt ". All who seek to achieve an atmospheric Utopia must so increase their efforts as to ensure that his crystal-gazing is as effective as his bell-ringing.

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OBITUARY

We regret to have to record the deaths of two of the Society's Vice-Presidents: Mr. Allan Ritchie of Edinburgh and Alderman J. J. Milton of Bristol.

Allan Ritchie, M.B.E., previously of Paisley, was for many years Chief Sanitary Inspector for Edinburgh. He had a long and close interest in clean air, being associated with the Scottish Division of the Society from 1929, and later was its President. He also became a member of the Executive Council of the National Society, until his retirement from Edinburgh, when he was elected a Vice-President. During the last few years he was Food Hygiene Officer for the Department of Health for Scotland. Allan Ritchie was a man whose fine personality and integrity made him liked and respected by all who knew him. He became an elder statesman in the field of environmental hygiene in Scotland, and indeed throughout the United Kingdom.

Alderman J. J. Milton, O.B.E., for many years Chairman of the Bristol Public Health Committee, was a good friend of the clean air movement, in which he was intensely interested. He attended many of the Society's conferences and at home had a fine record of distinguished service to his city.

We also regret to learn of the death of another good friend who represented his Authority with the Society for many years: Alderman S. T. Marron of Oldham. He, too, did much to promote clean air policies in his town and the north-west.

Vehicle Exhaust Research

At the annual dinner in London recently of the Institute of Road Transport Engineers, the newly-elected President, Mr. R. Gresham Cooke, M.P., spoke of smoke emission and the maintenance of diesel equipment. He said the time had come to set up a panel to investigate the operation and development features of diesel units.

It would be made up of users, equipment manufacturers, vehicle designers and other interested parties, including perhaps the Ministry of Transport. Such a body might be called the Vehicle Exhaust Research Association, or VERA for short.

Appointment

Mr. Alan A. Mister has been appointed as Assistant Secretary to the Society and joined the staff on November 26.

FIRST TO COMPLETE SMOKE CONTROL PROGRAMME

Distinction for Holborn

The Metropolitan Borough of Holborn completed its smoke control area programme on December 1, and thus joins its neighbour, the City of London, as a completely smokefree authority. The City was a special case, using its own Act, and Holborn has achieved its distinction by being the first local authority in the country to reach its final target under the provisions of the Clean Air Act.

There had been speculation as to which authority would win the race to be first, and it has been done by Holborn through a spurt which has cut by four years the target date set when the programme was first considered in 1956, and is a year ahead of the revised programme drawn up in 1959.

The scheme now completed includes nearly 10,000 homes, Government departments, and many other, and very varied, premises. It has cost the borough £12,000 in grants for conversions, and it is estimated that nearly 6,000 tons of coal a year have been replaced by smokeless methods.

It was announced, as we went to press, that the Minister of Housing and Local Government, Sir Keith Joseph, would visit the borough on December 3 and would hold a news conference in the Town Hall.

The announcement of Holborn's success was reported to a meeting of the Executive Council of the N.S.C.A. on November 22, when a resolution was passed conveying to the Mayor of Holborn and the members of his Council the warmest congratulations of the Society.

The fact that one important borough has achieved smokelessness is an event of prime importance to the drive for clean air. Being the first of the many, it will encourage the others, give point to the propaganda they need, and in short marks the beginning of a new era.

Hendon Lecture Course

Hendon College of Technology announces that a course of four lectures on air pollution will be given on Mondays, March 4 to 25, 1963. The lectures will be given by Mr. R. C. Braun and Dr. V. D. Long. Fee, 10s., and details from The Bursar, Hendon College of Technology, The Burroughs, Hendon, N.W.4.

Research Project

The London School of Hygiene and Tropical Medicine announces that it is undertaking a long-term research project on personal and environmental factors in cardio-respiratory diseases, including lung cancer, chronic bronchitis, and coronary heart diseases. The project has the support of the Tobacco Manufacturers' Standing Committee, which has agreed to contribute £50,000 a year for ten years. The honorary director of the project will be Prof. D. D. Reid, professor of epidemiology at the School, and Prof. Peter Armitage, professor of medical statistics, will collaborate.

Collectron Expands

Collectron Ltd., manufacturers of the Collectron dust collection equipment for industry, announce that owing to increased business in the midlands and north, a sales office has been opened at Paris House, Market Square, Rugeley, Staffs. The new office will be under the personal direction of the general manager, Mr. John M. Hodgson.

NEW GOVERNMENT CIRCULARS

Fuel Storage : Smoke Control in Scotland

The Ministry of Housing and Local Government has issued to local authorities in England and Wales a Circular (50/62, October 1, 1962) concerning fuel storage in new local authority housing. This refers to the minimum standards set out in the Housing Manual, 1949, and endorsed in the report " Homes Today and Tomorrow ", which the Minister has commended to local authorities. The circular continues:

" The Minister has received repretations on the difficulties which a strict adherence to these minimum fuel storage requirements might create in smoke control areas because of the greater bulk per ton of coke and other solid smokeless fuels. With restricted storage, householders may have difficulty in stoking adequate supplies of the fuels they must use, and cannot take full advantage of cheaper deliveries in summer.

" The Minister is satisfied that the standards now in force represent a reasonable minimum standard of fuel storage for most areas and that there is no case for requiring a higher standard everywhere. He recognises, however, that in existing or prospective smoke control areas a more generous provision of storage space is desirable. Accordingly he asks local authorities, when considering the plans of new dwellings in areas covered, or likely to be covered, by smoke control orders, to give particular attention to this point and to satisfy themselves that the fuel storage facilities are adequate for the type of fuel that may have to be used. Much will depend upon local delivery services, and the extent to which heating systems not primarily dependent on solid fuels are to be used. But where solid smokeless fuels are to be the main source of heating, local authorities should in general aim to make provision for a higher standard of storage than the minimum."

A further paragraph drew attention of the publicity value to local authorities of the new film " Clean Air ".

Scotland

The Scottish Development Department has issued a Circular (22/1962) to local authorities in Scotland on smoke control areas. This is concerned with the modifications of procedure dealt with in the Ministry of Housing and Local Government's Circular 3/62, reported in this journal in its Spring, 1962, issue (page 186).

The main difference between the two circulars is that the new one for Scotland modifies a procedure that initially differed from that for England and Wales. Local authorities in Scotland have been asked, prior to submitting proposals for a smoke control area, to notify the Secretary of State of their intention, so that, if necessary, he could give a warning that any proposals should be modified or postponed. The new circular states: " In the light of the experience which has now been gained of the operation of the provisions of the Clean Air Act relating to smoke control areas the Secretary of State does not consider that there is any longer a general need for all proposals to be referred to him before smoke control area orders are formally submitted for his approval. In future, therefore, local authorities who have already made one or more smoke control areas will not be required to notify the Secretary of State of their intention to make further orders." Local authorities who are contemplating making their first smoke control area order are asked to continue to notify the Secretary of State, as before.

The new simplified form for scheduling estimated costs is appended, together with a revised version of paragraph from the memorandum on smoke control areas concerning the criteria for the approval of conversion grants.

NATIONAL PRODUCTIVITY YEAR

WHY CLEAN AIR AIDS PRODUCTIVITY

- **£300,000,000 is the yearly cost or waste of national resources due to air pollution.**
- **Air Pollution is a major cause of the 27,000,000 working days a year lost through chronic bronchitis,**
- **Smoke is unburned fuel: is a sign of inefficiency and loss of productivity.**
- **Air Pollution injures plant life, adds to farming and market gardening costs and cuts production.**

National Society for Clean Air
Field House, Breams Buildings, London, E.C.4

Clean Air and the N.P.Y.

The importance of clean air to the drive for higher national productivity is well stressed in the Presidential Address recorded on another page. Many of our Local Authority and other members are participating in the Year and we would urge them to relate it to their clean air activities. Above is a layout for a poster which the Society is preparing and will supply to members at a price of 10d. each, or 5s. 6d. for 10 copies, postage included. (Size: 30 in. by 20 in., printed black on yellow.) Please address orders or inquiries to the Director, N.S.C.A., Field House, Breams Buildings, London, E.C.4.

INTERNATIONAL SECTION

West Germany

CONFERENCE AT STUTTGART

Life and Clean Air in Industrial conurbations was the theme of the Conference held by the V.D.I. Clean Air Commission in Stuttgart from October 10 to 12, and attended by 850 delegates consisting mostly of industrialists, scientists and government representatives. Their aim was to discuss the means which must be taken in the near future to improve living conditions in such densely populated areas.

Chairman of the Clean Air Commission, H. Lent, said in his opening speech that since the last Conference in Wiesbaden two years ago, it had become clear to the widest public that clean air was an obvious implication of healthy life. He expressed his appreciation of the co-operation given to the work of the V.D.I. by government bodies, industry and various branches of science, thus enabling the research into air pollution prevention to continue.

The first series of papers at the Conference were concerned with the role of clean air in protecting organic life, and in his introduction, W. Liese of the Berlin Public Health Department stressed the lack of knowledge about danger from toxic substances in our environment and the difficulties of research in the field of air hygiene.

" Demands of medicine for clean air, from the toxicologist's point of view " was the subject of a paper by W. Neumann of Würzburg. Among the ever increasing air pollutants in our atmosphere he mentioned carbon monoxide as belonging to those which menace our health and well-being. The exact connection between the frequency of certain chronic ailments and air pollution in highly populated industrial areas has not yet been evaluated. It is clearly established however, that tobacco smoke contains at least twelve, and the air over big foreign cities at least five different organic polycyclic hydrocarbons which have caused principally cancer in animal experiments. Concentrations of sulphur dioxide measured in industrial areas often cause concern, but nitrogen gases and unsaturated hydrocarbons from motor exhausts are not a toxicological problem in Germany as in Los Angeles. In conclusion the speaker dealt with the maximum immission concentrations (MIK values) for the various air pollutants and the distinction between the smell and irritation thresholds. He demanded that the emission of such substances should be limited so that the MIK values could always be observed under normal weather conditions.

" Comparisons of the soot and carbon emissions in the Federal Republic and in other countries " by H. O. Hettche (Hamburg) stressed the importance of ascertaining tolerable limits for air pollutants and to study their sources, quantities and concentrations. Soot, polycyclic aromatics and carbon monoxide caused by combustion processes, are of particular hygienic significance. In U.S.A., England, Paris and Hamburg dangerous concentrations of pollutants have been measured freqently and in the U.S.A. and England there is an approximately 6 per cent. annual increase in lung cancer, in which the polycyclic aromatics (*e.g.* 3-4 benzpyrene) play a very important part. Soot particles emitted by periodically worked oil-fired installations should also be mentioned as an air pollution factor.

W. T. Ulmer (Bochum) in his paper on " Effects of air pollution on human health " mentioned the possible danger when gases such as SO_2, NO_2, etc., combine with liquid and dust aerosols, whereby the transformation products in the atmosphere could increase or decrease its toxicity. Each individual must play his part in keeping the air clean, as it is not only industry but also tobacco consumption, domestic heating and motor exhausts which contribute to the endangering of our health. The doctor and the engineer therefore must co-operate in recognising the existing problems and in working together to solve them.

Vegetation

" The significance of clean air in protecting vegetation " was the contribution of H. Ullrich (Bonn) in which he explained that owing to the different respiratory system of plants, the quantitative determination of harmful effects cannot be related to the substance concentrations in the air as simply as in the field of human medicine. The higher green plants absorb air through their pores and are affected by a day's or possibly year's pollution in the air. Among useful plants the degree of damage depends also on their kind of nourishment. Sulphur dioxide, nitric oxide and organic solvents are particularly harmful components, and plant protection remedies should also be considered as air pollutants. In general, vegetation makes higher demands on clean air than men and animals; it is very difficult to formulate any MIK values and only possible after further research.

G. Rosenberger (Hanover) presented a paper on " Immission effects on animals " in which he stated that there were considerable differences in effects on animals and human beings, so that for instance cement dust and coal fly ash are considered to be harmless to animals, but fluorine the most injurious. Constant inhalation or ingestion of pollutants by animals over long periods causes sub-acute or chronic ill health. Lead poisoning shows symptoms such as excitability and lameness, and fluorosis deformities of teeth and bones. In order to understand animal diseases in connection with industrial emissions, it is necessary to examine the animals clinically and their food and organs chemically. All possible means should be taken to limit the emission of substances harmful to animals from industrial premises.

The next series of papers dealt with the present position and limitations of technical methods in air pollution prevention.

Motor Exhausts

H. Luther (Clausthal-Zellerfeld) gave a review of " Measures taken and possibilities of changing the exhaust gases of internal combustion engines ". He described the troublesome and harmful components of motor exhausts and discussed the different measurement methods and the possibilities of removing CO, hydrocarbons and aldehydes. A transformation of exhaust components could result by (*a*) various modifications to the engine, (*b*) filtering or washing, (*c*) after-burning with and without catalysts, (*d*) additives affecting the combustion process.

H. Schwartz (Essen) in his paper " Air Pollution Problems in the U.S.A. —Comparison with Germany " ascribed the successful and energetic prevention measures in the U.S.A. to the great efforts of the many research institutes and advocated that their speedier methods should be adapted to German conditions.

" Development of removing SO_2 from sulphur-rich coals and heating oils " by G. Spengler (Munich) stated that so far no efficient and economic way had been found of removing SO_2 from the atmosphere. Various possibilities are discussed, such as removing the sulphur from fuel, use of additives, gasification of fuel and importance of chimney heights.

W. Barth (Karlsruhe) in " Possibilities and limitations of mechanical dust removal" reviewed the existing methods such as cyclones, filters and wet-arrestors, as well as electrofilters which on the whole were superior to the rest. On a similar subject a paper was given by K. R. Schmidt (Erlangen) "Technical limitations of fine dust removal". The author found room for improvement in present techniques and reported about a new rotating dust collector which gets better result with fine dusts.

Domestic Sources

J. Kramer and H. Kettner (Dusseldorf) in "Clean air measures for houses and small industries" said that these sources were responsible for 25 per cent of atmospheric pollution. They listed means of smoke abatement with special reference to oil firing and the relevant VDI standards. Control should be exercised not only over the actual fuel appliance, but over the whole installation. The paper mentioned the methods employed in England and U.S.A. of preventing pollution from domestic and small industrial sources, and suggested that they were patterns of what had yet to be achieved in the Federal Republic.

The final group of papers of the Conference dealt with the legal, administrative and planning measures for keeping the air clean.

H. Oels (Bad Godesberg) gave a review of the laws and regulations on the federal and district basis and expressed the hope that in the first half of 1963, the first part of the "Technical Instructions" would be issued. He concluded that keeping the air clean was the task of the whole community.

Town Planning

The different ways in which proper town planning can prevent undue air pollution, were the subject of papers by K. H. Tietzsch (Essen) and E. Kühn (Aachen). The last paper by W. Hanstedt (Essen) on "Planning of Waste Disposal and Utilization in the Ruhr district, from the point of view of clean air" stated that in big cities there was 200 kg. of waste material per head per year. A new organization has been formed to advise on composting or incineration of waste. Several installations for waste disposal in the Ruhr district are described and it is concluded that according to local conditions each solution must be different.

REPORTS FROM SOUTH AFRICA

WE have received from the Information Officer, Mr. C. E. Latsky, of the Air Pollution Research Unit, National Physical Research Laboratory, Johannesburg, a number of recent publications on the clean air development and research now in progress in South Africa. They include a special 32-page Smog Supplement of the *Financial Mail*, dated August 24, 1962. This describes both the air pollution problem in the Union and the technical aspects and methods for its control. There are the familiar kinds of air pollution problem to be tackled, but in addition South Africa has some that are unique. Thus there is that of the dust blowing off the mine dumps of the Reef, which has been a costly nuisance for generations, and there is that of the ground level smoke from open air fires and braziers in the Native townships. A table shows smoke and sulphur measurements in Pretoria, Johannesburg, Durban and East London, the figures being comparable with those in Britain. Johannesburg appears to be the most heavily polluted city, with a mean winter smoke concentration of 0·321 mg./m^3. and an SO_2 concentration of 0·154 mg./m^3.

The supplement includes part of a lecture by Dr. E. C. Halliday, Director of the N.P.R. Laboratory and the C.S.I.R., and head of its Air Pollution Research Unit, dealing with the legislation that is needed to promote clean air. Several of the other papers received are reprints of papers by Dr. Halliday, to whom South Africa owes much for his keen advocacy of clean air, backed up by research, analysis and study.

Other reprints are by Dr. Etel Kemeny, including one on " Radiation Inversion over Pretoria ", and one by S. C. Mossop and H. W. Scott on " Chloride Particles in the Atmosphere at Pretoria ".

Finally, there are reports of the " Conference of Contributors to the Air Pollution Research Fund ", which is associated with the C.S.I.R., and which in some respects is akin to our own Standing Conference of Co-operating Bodies for the Investigation of Air Pollution. Comprising a number of municipalities and industrial associations, the Conference held its first meeting in October, 1961. It has set up a Technical Advisory Committee, among the projects of which, either in action or being considered, are:

A survey of chemical entities existing in city air as pollutants.

A study of the degree to which pollutants are dispersed in the atmosphere under various conditions.

Problems associated with the supply of cheap smokeless cooking facilities for non-Europeans.

A study of factors affecting the efficiency of retention of small particles in scrubbers.

The supply of technical information on the elimination of pollutants of air pollutants.

NEWS FROM U.S.A.

from Arthur C. Stern

U.S. Public Health Service

Russian Tour. A six-man delegation of American environmental health and sanitary engineers ended a one-month tour in October of health and engineering facilities and programmes in the Soviet Union. Vernon G. MacKenzie, Chief, Division of Air Pollution, U.S. Public Health Service, was chairman of the group. The visit was made under terms of an agreement between the U.S. and the U.S.S.R. for the exchange of people and information in the scientific, technical, cultural, and education fields.

Air Conservation Commission. An Air Conservation Commission has been created by the Committee on Science in the Promotion of Human Welfare of the American Association for the Advancement of Science. It consists of 12 members headed by James P. Dixon, President of Antioch College, Yellow Springs, Ohio, and will attempt to inform the public about the " scientific and social questions that are involved in air pollution ". The Commission's office is at 2151 Berkeley Way, Berkeley, California, and its Executive Secretary is Miss Mollie Day.

California. Governor E. G. Brown announced on August 15 that the State of California will assume full responsibility for all testing and research affecting smog from motor vehicles starting July 1, 1963. In essence, the State will take over the Los Angeles County Air Pollution Control District laboratory after reimbursing the County on a 50-50 basis for its present physical investment. This means the State will pay the County approximately $150,000 and will thereafter operate the testing facility at an annual cost of $370,000. The facilities involved include an automobile laboratory with six dynamometers and two large environmental test chambers in which smog is synthesized and studied.

Recent approval by the California Motor Vehicle Pollution Control Board was won by four new automobile crankcase devices. This brought the total number of *crankcase* devices approved to eleven since the approval programme began in July, 1960. Acceptance of a fifth *exhaust* device for fleet and life testing was announced by the Board on August 13. Tests of these devices and others accepted for testing are expected to take at least nine months to complete.

Pennsylvania. In May the Pennsylvania Air Pollution Commission adopted the following regulations: Regulation I requires that coal refuse disposal areas be operated in a manner so as not to cause air pollution. Regulation II regulates open burning in the disposal of garbage, rubbish and trade wastes and in salvage operations.

New York City. The Control Board has adopted amendments to its Rules and Regulations which require the installation of an automatic smoke detection device on fuel-burning equipment using bituminous coal or residual oil as fuel. The new regulation will also affect construction of incinerators in New York City.

(Mr. Stern is acting as Executive Secretary for the National Conference on Air Pollution to be held in Washington on December 10 to 12, which was referred to in our last issue. The Conference is open, and Mr. Stern extends a cordial invitation to any members of the Society who can join them on this occasion.—Ed.)

W.H.O.

BRUSSELS CONFERENCE

A W.H.O. seminar on Clean Air was held at the beginning of October in Brussels when nineteen European countries were represented as well as the Council for Europe and the O.E.C.D.

The seminar reviewed the situation in each of the countries represented and the legal measures under consideration or in operation for the control of air pollution. It discussed standards associated with the measurement of pollution and considered practical measures for air pollution control. The summary report of the seminar is awaited with keen interest and the later full report of the proceedings should provide much material for consideration by those who are dedicated to cleaning the air.

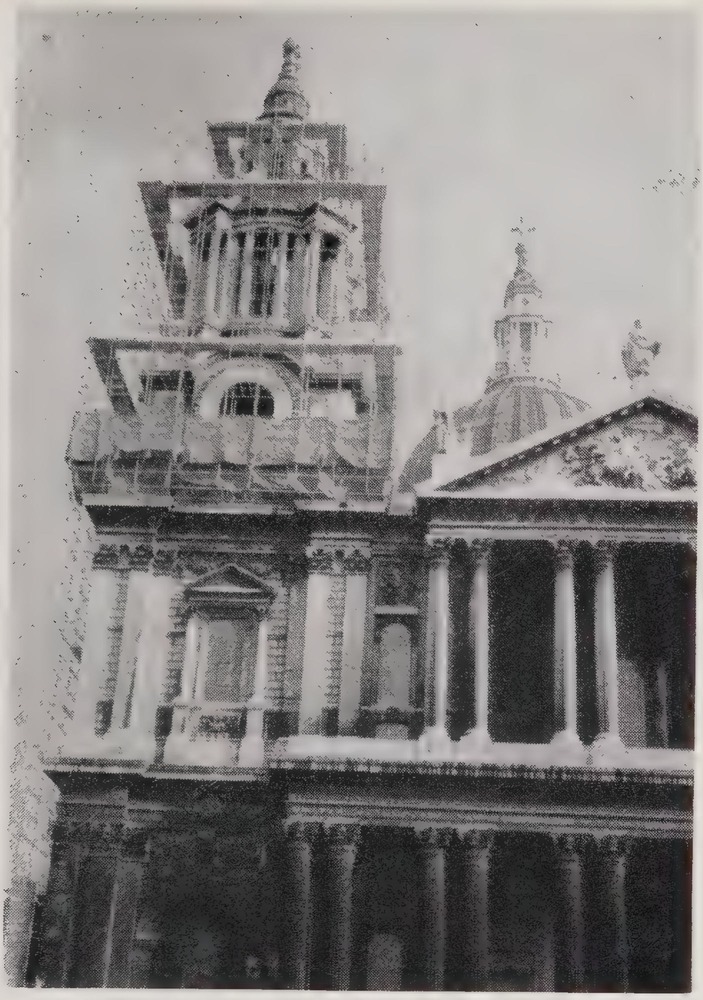
The small group of experts attending included a number well-known in clean air circles in Great Britain. Professor Leclerc of Liège who it will be remembered wrote the account of the Meuse Valley disaster in 1930 was elected Chairman of the seminar and our own Technical Committee Chairman, Dr. Burnett, was appointed Vice-Chairman. Dr. Ellison of the Medical Research Council Air Pollution Research Unit undertook the onerous task of rapporteur, whilst Dr. Wilkins of the Warren Spring Laboratory and Dr. Hulse of Sheffield University read papers on their particular specialities. Others present who have been associated in one way or another with this society were Dr. Kettner of Dusseldorf and Mr. Brasser of the Hague, whilst a paper was read from Prof. Riazanov of Moscow who attended the Society's International Conference in London in 1959.

France

CHEMICAL POLLUTANTS

The September issue of the journal of the Association for the Prevention of Air Pollution of France (APPA) is devoted to papers read at the International Conference of the French Society of Chemical Industry in Paris April 25 to May 4 last. One day, organized by APPA. was given over to air pollution problems in the chemical industry, and the papers read are included in this issue of the journal.

New York State Health Department has issued a poster urging that leaves should not be burned. It is suggested that they should be stored in bins until they have decayed, and then returned to the soil.



CLEANING ST. PAUL'S

Blackened and eroded by over 250 years of London's smoke, the West Front of St. Paul's cathedral is being cleaned. The estimated cost of £10,000 has been made possible by two anonymous donors. From the open sweep of Ludgate Hill we shall see the cathedral as Wren conceived it, and it is fitting that this should be done at the present time, when the age of smoke is at last coming to an end. There has been controversy about it, for some would preserve the building in all the dirt and drabness that was foreseen and lamented even in 1700, before it was finished. St. Paul's can be made to be " all bright and glittering in the smokeless air ", or, kept in its dirt, it will become an increasingly pathetic relic of London's unhappy age of gloom and smog.

CLEANER AIR AT CHALK FARM

The Chalk Farm (N.W.1) Tenants' and Residents' Association has been campaigning most energetically for a number of years against the local problem of smoke from the railways Camden Motive Power Depot, and many representations have been made to British Railways, St. Pancras Borough Council, the L.C.C., and the N.S.C.A.

Their efforts have now been hailed as " Victory " in the October issue of the Association's news-sheet, *The Record*. This quotes measurement observations from the L.C.C. which show a considerable improvement since 1958-59. Thus smoke (parts per 100 million) for November 1958 to March 1959 was 99, compared with 59 for the corresponding period 1961-62. SO_2 fell from 18·3 to 11·7, and the number of days on which average smoke concentration exceeded 100 mg. fell from 68 to 16.

So far so good, but the Association quotes a letter from the Assistant General Manager of the London Midland Region, British Railways, which states: (1) that except when it is not possible, all trains into Euston are scheduled to be hauled by diesel locomotives; (2) there has been no change in the policy of using coke whilst steam engines are in the depot; (3) the diversion of certain trains from Euston to St. Pancras will result in fewer locomotives, including steam, using the Camden Depot; and (4) the programme is to complete the electrification of the Euston line in 1966, when the Depot will be closed. We should like to congratulate the Association, and also British Railways, on what looks like being a happy ending to a problem that has been difficult and irritating to both sides.

THE HARROGATE CONFERENCE AND EXHIBITION

The Society's 29th Annual Conference and its 5th Clean Air Exhibition took place at Harrogate from October 9 to 12, and on both events the verdict has been that both were most successful. The Conference, attended by just under a thousand delegates, had a full and varied programme which, unconventionally, began on the day before the official opening. This " pre-conference " session was a technical meeting on the pollution problems of the iron and steel industry, to which both Conference delegates and outside visitors from the industry were invited. The three important papers were presented to and discussed by a very good audience, and what was frankly an experiment is likely to be repeated at special technical sessions in the future.

Although it was unusual (because of Government changes and the Conservative Party Conference clashing with our own) not to have a Minister at the opening session on the Wednesday morning, a full house of delegates was more than satisfied with a most friendly civic welcome from the Mayor of Harrogate, Councillor Norman Morrell, and a Presidential Address by Lord Cohen of Birkenhead that was outstanding both in its content and in the way it was read. It is recorded elsewhere in this issue.

For the afternoon session there was a series of international papers and reports, varying greatly in their nature, from Holland, France, West Germany, Eire, Northern Ireland and the United Kingdom. Delegates seemed to be shy of questioning them and discussion was somewhat sparse, but we can assure those who were not present that the printed record of the session, to be included of course in the forthcoming *Proceedings*, will be found to be most instructive and interesting.

Message to the Conference from the Minister

The following message was received at the Harrogate Conference from the Rt. Hon. Sir Keith Joseph, Bt., M.P., Minister of Housing and Local Government and Minister for Welsh Affairs, where it was read by the President.

In the field of environmental health, one of the greatest challenges to our generation is the need to clean the air of our cities and towns. That so many people now realize this fact is to a great extent due to the devoted work of the National Society for Clean Air. No one appreciates the value of this work more than I.

I wish your Conference every success. I am sure the papers and discussions will be interesting and stimulating, and I hope all of you who are actively concerned in the fight for clean air will leave the Conference with renewed determination to get on with this vital job as fast as possible.

(*Signed*) **KEITH JOSEPH**

Thursday morning gave the Conference the opportunity to pay a tribute to the author of the one paper presented: Dr. J. S. Carter, the Chief Alkali Inspector. Dr. Carter, despite personal difficulties, introduced his paper and dealt with numerous comments and questions with a humour and urbanity that won him well-deserved applause. The paper itself is reproduced on another page, and in the *Proceedings* it will be followed by a record of the lively discussion.

On the Thursday afternoon the Conference Hall was packed, as a number of parties of women's organizations were present as specially

Animation was the key-note of the Exhibition

invited visitors, to hear a representative panel deal with as choice a variety as can be imagined of questions on domestic smoke, heating, and smoke control area problems. A great deal of authoritative and useful information was put over by the panel, spiced with a certain amount of banter and repartee.

The attendance kept up splendidly for the final session on Friday morning, when Mr. S. C. Cayton had the platform to himself for a valuable paper on a widespread problem—that of incineration and the disposal of waste.

The usual informal " get together " on the Tuesday evening was again well patronized and clearly welcomed by delegates as an opportunity for meeting and talking. And, it is hardly necessary to say, the main social event, the Civic Reception by the Mayor and Mayoress, on the Wednesday evening, was a delightful occasion, with dancing for the many who desired it. It helped, as did the whole of the Conference, to create the pleasant feeling that it was good to be back in Harrogate, with its friendly Yorkshire hospitality and its agreeable environment.

James Orr, of " Coalite ", explains things to the President and the Mayor

The Exhibition

The Society's Exhibition held in conjunction with the Conference, was in the excellent exhibition hall adjoining the Conference Hall. This year it was called the Clean Air, Fuel Efficiency and Domestic Heating Exhibition and certainly deserved, from its comprehensive character, the more descriptive title. There is no doubt that it was a first-class show in every way. As before, the individual stands were well-designed and equipped and both industrial and domestic interests were well represented. To pick out a few worthy of special mention would be difficult as well as being invidious, so high was the general standard. Good publicity about the exhibition brought in many visitors—of the kind who matter—and with Conference delegates they helped the show to maintain a lively, busy look throughout the three days it was open.

The success of the exhibition was indicated by the number of exhibitors who sought to reserve space, and often more space, for the next exhibition, which will be in Scarborough in October, 1963.

President and Mayor at the Collectron Stand. Centre background is Mr. P. D. Coates

Home Heating and Hot Water

The Gas Council has published an attractive and informative handbook, Home Heating and Hot Water by Gas, which it is said is " designed to present the case for gas space and hot water heating in the broadest terms ". It describes, with a wealth of illustrations, many in colour, space heating systems and appliances, with costs, and then reviews the question of hot water supply and the ways in which this can be done by gas. The last section of the handbook is on flues.

From our clean air viewpoint we are chiefly interested in the use of gas for space heating, and the handbook fully describes and illustrates the three methods: single room heaters; fan assisted warm air heating; and central heating by hot water. Useful information about costs is included.

Solid Smokeless Fuel Information

The latest booklet issued by the Solid Smokeless Fuels Federation is " Home Heating for You ", an eight-page publication giving clear information about the different types of appliance suitable for solid smokeless fuels. It is especially suitable for distribution in areas about to become smoke controlled, and we understand that there is a big demand for copies. In addition to descriptions of appliances there is a compact table showing the different kinds of smokeless fuel and of the types of appliance for which each, and each size, is suitable. Copies may be obtained from the Federation at 74 Grosvenor Street, London, W.1.

Cement Works Dust Protest

Printed postcards asking the Minister of Housing and Local Government to do something about the fall-out of dust from the cement works in north-west Kent have been distributed in Dartford and Crayford, and it is estimated that more than 60,000 have fallen " out of the postman's bag on to Sir Keith's desk in Whitehall ", as the *Evening News* put it.

The Spencer Works

Control of Air Pollution

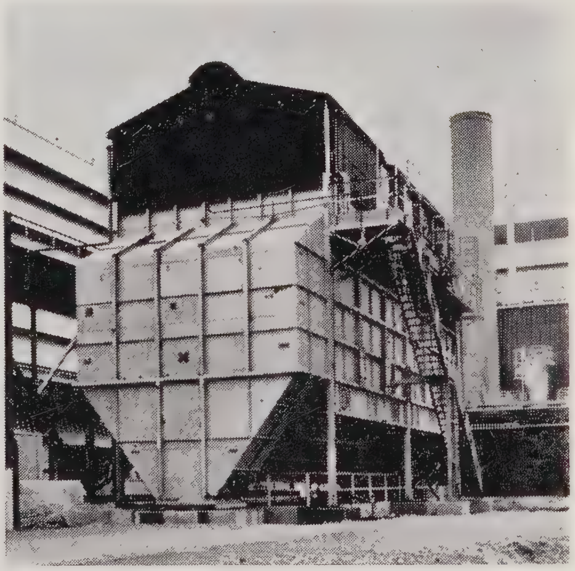
A general view of the Spencer Works

At the great new Spencer Works of Richard Thomas and Baldwin at Llanwern, opened by H.M. the Queen on October 26, many precautions have been taken to minimize the pollution of the air. As a writer in the special supplement of *The Times* put it: " It was a green field site and the intention was to maintain the rural environment as far as possible, not only in the works but in the surrounding areas ".

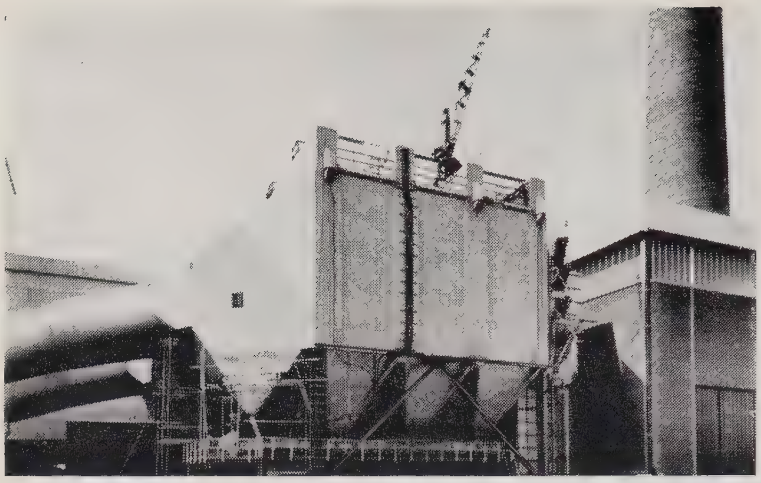
Some minimal pollution can hardly be avoided, but measurement observations are being made—and were indeed started almost as soon as work started on the site—so that if any increases are noted steps can be taken to discover the cause. Local authorities have been consulted and with their help monthly observations are being made at sites up to five miles from the works.

Screens, electrostatic precipitators and filters are incorporated for the various operations, and high chimneys help to promote the dispersion of the flue gases.

Thus, for example, to handle the waste gases from the main sinter strands, two Howden-Lurgi electrostatic precipitators are provided (one per strand). Each precipitator treats 51,000 cubic feet per minute of gas having an inlet dust concentration of 2·18 grains per cubic foot at N.T.P. Outlet dust concentration of clean gases is 0·044 grains per cubic foot N.T.P., giving a precipitator efficiency of 98 per cent. To eliminate dust nuisance from the discharge end of each strand an extensive system of hoods and ducts is provided to pick up the dust at the discharge from various sections of the strand. The



The Lodge-Cottrell Scarfer fume cleaning plant



" B " side Main Sinter Strand, Howden-Lurgi electro-precipitator

airborne dust is extracted in two Howden-Lurgi (dry type) electro-precipitators, each treating 212,000 c.f.m. of gas. Inlet concentration at 6·5 grains per cubic foot is cut down to 0·044 grains, giving a precipitator efficiency of 99·32 per cent. The dust is collected in hoppers below the electrode chambers and continuously withdrawn from these by drag link conveyors for return to the sinter mix.

On the blast furnace side gas cleaning plant has been provided by Lodge-Cottrell, Ltd., a member company of Simon Engineering Ltd. The plant deals with 20 million cubic feet of gas per hour, with a dust concentration of up to 6 grains per cubic foot. There are six independent units, all of which are capable of complete isolation, and each is comprised of a tower for gas cooling followed by an electro filter which cleans the gas to 0·002 grains a cubic foot. In effect, say Simon's " this degree of cleanliness is considerably greater than the atmospheric air which we breathe ".

In the electrical filter the dust particles in the gas are precipitated on to a film of water which is continuously flowing over the collector electrodes. This water is re-cycled to the cooling towers, thus ensuring a real economy in the amount of water in circulation.

From the towers, the hot, dirty water is conveyed by means of launders to two thickeners. Sludge extracted from these is pumped to a drum filter type filtration plant, the moist cake from which is then treated in a drying plant. The dry cake has a most useful iron content and is used for blending with iron ore fines for sintering and re-use in the blast furnaces.

Altogether, more than 10,000 gallons of water a minute are in operation when all six units are working. The cleaned gas, which is a valuable source of heat, is available for use as required in the blast furnace stoves, coke ovens, boilers and other ancillary plant.

Scarfer Fume

In the scarfing operation, superficial scale or excrescences are removed by flame-cutters from the hot blooms or slabs of steel in the rolling section of the works. A considerable amount of fume and fine dust is produced during this operation. The Lodge-Cottrell installation includes the I.D. fan, inter-connecting ducting, and electrical precipitator and chimney stack. The fumes from this are dealt with by Lodge-Cottrell precipitators of the wet type, incorporating multi-stage treatment. With an inlet dust concentration of 3 grains a cubic foot, the outlet emission is guaranteed not to exceed 0·03 grains a cubic foot—an efficiency of 99 per cent.

The L.D. Plant

The Spencer works is the first in the world to use one of the new oxygen processes for steel production to the exclusion of all other methods. This is the L.D. process. Here the waste gases are cleaned by venturi scrubbers.

REGD TRADE MARK

FOR THE NEW SPENCER WORKS

At the new Spencer Works of R.T.B. at Llanwern near Newport, Mon., we have supplied and installed all the Howden-Lurgi Electro-Precipitators, Sinter Fans, De-dusting Fans, Sinter Cooling Fans and the Howden-Lurgi Lifting and Lowering Wheels for the Lurgi Sinter Machines. Howden also supplied the Fans, Air Pre-heaters and Dust Collectors for the Mitchell Engineering Boiler Plant.

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North West's Big Meeting

Address by P. D. Coates

THE North West Division held a most successful meeting in Bolton on October 31. The attendance of about 500 was, as far as recollection serves, the largest for any meeting of one of the Society's Divisions. The Divisional Chairman, Mr. J. W. Rodgers, presided, and introduced the speaker, Mr. P. D. Coates, Assistant Secretary, Ministry of Housing and Local Government. Mr. Coates, who is very closely concerned with the Clean Air Act is well-known to many of our members and to the members and officers of local authorities, with all of whom he stands in high esteem.

After reviewing the consequences of air pollution to health and family life Mr. Coates made an important point that ought to be recognized and heeded by many local authorities, especially in the midlands and north.

" The Report of the Toothill Inquiry into the Scottish economy ", he said, " said that places wanting to attract new industry should make themselves clean and attractive, as industrialists and key workers may be put off by their impressions of a dirty, physically unprepossessing town. It said that clean air was perhaps the first need in this respect, because without clean air the scope for other improvements was more limited, and it referred to the ' depressing tenacity ' with which soot adhered to the older parts of Scottish towns. May not these remarks contain a lesson for England as well as for Scotland? "

Open Fire Fuels

Mr. Coate's words on coke as an open fire fuel may also be quoted in full:

" Householders in smoke control areas thus have a wide choice of fuels, and it is for them to decide whether their individual domestic needs will best be met by smokeless solid fuel, gas, electricity or oil. Householders who decide on smokeless solid fuel may choose between a further range of types of fuel and complementary types of appliance. Burning gas cokes on an open-fire is only one of many ways of heating rooms in smoke control areas.

" However, gas cokes are normally the cheapest smokeless solid fuels for open fires. Very many people inside and outside smoke control areas find coke a satisfactory and economical

Mr. Coates, speaking at Bolton. On the left is Mr. J. W. Rodgers, Chairman; and right are Dr. J. L. Burn, Dr. J. S. G. Burnett, Mr. S. N. Duguid, and Mr. T. Williams, C.P.H.I., Bolton

At the Bolton meeting. Left to right: Mr. R. J. Stanyard, N.W. Divisional Hon. Secretary; Mr. J. W. Rodgers, N.W. Divisional Chairman; Mr. P. D. Coates; Alderman J. A. Childs, Mayor of Bolton; Mr. Arnold Marsh, Director, N.S.C.A.; Dr. J. L. Burn, Chairman, N.S.C.A.; and Dr. A. I. Ross, M.o.H., Bolton

open-fire fuel. Yet one must face the fact that when smoke control orders are made some people are reluctant to try coke as an alternative to coal or are disappointed with the results if they do try it. Why is this?

" To get satisfaction from coke on an open fire, two things are essential. First the coke *must* be coke specially manufactured for open fires, not just any old coke. Secondly, the grate *must* be designed for coke burning and *must* be properly fitted. People who burn the wrong sort of coke or who burn coke on the wrong sort of grate will never get satisfactory results. And gas or electrical ignition is very desirable for coke fires; sticks and paper are not convenient for lighting coke.

" There is no obligation on householders to burn any particular fuel in smoke control areas; the obligation is simply not to make smoke. But local authorities, producers and distributors should do their best to ensure that householders know how to get the best results from coke.

" It is quite untrue that coke gives off unhealthy fumes which coal does not. The smoke is taken out of coal when coke is made, but nothing is put in. Both coal and coke give out fumes. Coal gives out smoke as well."

Getting on with the Job

" Some local authorities in the black areas ", continued Mr. Coates, " plan to move really fast in getting rid of smoke in their districts, and they can rely on full support from the Minister in any reasonable action they take. But the latest local authority programmes for cleaning up the black areas as a whole show that overall the rate of progress planned is still not fast enough. Local authorities who still expect to take more than another 15 years over the job should have another good look at the plans and see whether they cannot aim at finishing earlier; if they have any special local difficulties the Ministry will be only too pleased to discuss them. There are, too, some local authorities in the black areas who have still not drawn up programmes at all. They should certainly search their hearts most carefully and consider the effects of their inaction on the health and well-being of the people in their districts. The latest programmes are just going to be published as a Blue Book."

Smog in Bolton

There was an excellent discussion and many questions, all of which the speaker dealt with with authority and to the point.

Speaking in the discussion the Medical Officer of Health for Bolton, Dr. A. I. Ross, said that they had had a five-day smog in January, 1962, with a five-fold increase in the concentration of pollution in the air. During the week of the smog deaths from respiratory diseases had been 49, compared with 27 during the corresponding week of 1961, while for the whole month the deaths had risen from 71 to 154. Moreoever, the deaths were proportional to the level of pollution in the different wards of the town.

In reply to a question about the sale of bituminous coal in smoke control areas by some merchants, Mr. Coates said that the Ministry had written on this matter to the Coal Merchants' Federation, which had declared its condemnation of the practice and their desire to be informed of any instances, so that they could take action.

Other Divisional News

The **East Midlands Division** met at the works of Streetley Delofrit, Ltd., on October 27, by invitation of the Company. The firm, which occupies modern premises erected about three years ago, manufactures refractory materials. The members were split into small groups and were conducted through the several departments including the quarry, the stone crushing mill and the rotary kiln. The arrangements for the arrestment of dust were described and demonstrated.

The members were entertained to lunch by the Company at the Normantion Inn, Clumber Park. The Secretary of the Company, Mr. J. D. Ridley, welcomed the party on behalf of the firm and the Chairman of the Division, Councillor M. Hewitt, replied. The Chairman of the Clowne R.D.C., Councillor C. Thorpe, J.P., in whose area the works are situated, also welcomed the delegates and said how pleased he and his Council were that the Society had met in the Rural District.

A lecture entitled " Dust Problems in Industry " was given by Mr. H. W. Thorp, BS.C., M.I.CHEM.E., A.R.I.C., Consultant to the Streetley Company. Mr. Thorp said that dust from domestic and industrial chimneys was only a small part of the problem, and mentioned several industries in which products could be ruined by small quantities of dust. In dealing with dust problems it was important to consider particle size and the type of plant for a particular problem. He showed by demonstrations the behaviour of dust according to the size of the particles. The lecture was illustrated by slides.

On November 5 the **Yorkshire Division** met in Bradford. A business meeting was held in the morning in the new offices of the North Eastern Gas Board, after which the members

Concluded on page 126

Members of the Yorkshire Division at the North East Gas Board's research centre at Bradford

CEMENT WORKS DUST

Commons Debate

In an adjournment debate in the House of Commons on November 13, Mr. Sydney Irving (Dartford) raised the question of cement works dust nuisance in North-West Kent. He spoke of " the exasperation, the resentment and anger that my constituents and many people in North-West Kent feel about the appalling fall-out of cement dust which they have experienced on at least five occasions in the last twelve months ".

He referred to a deputation in June to the then Minister of Housing and Local Government from the Thamesside Joint Committee for the Abatement of Atmospheric Pollution. It had made eight recommendations: (1) Within a prescribed period all kilns to be provided with modern precipitators. (2) No works to be operated without effective electrostatic precipitators. (3) All precipitators to be provided with automatic " continuity of operation " recording apparatus. (4) The Committee to be kept informed of maintenance and supervision. (5) Throughput to be related to precipitator efficiency. (6) If legislation did not provide for this, then new legislation should be introduced. (7) An experiment should be undertaken with automatic equipment for recording the burden of flue gases. (8) A special investigation should be undertaken by the D.S.I.R. on total daily emission in the area and scope for improvement.

Mr. Irving said that in parts of his constituency the dust falls at the rate of 100 tons a square mile a month, and the gauge readings last winter showed the highest deposits of dust since readings were commenced in 1954.

" But ", he continued, " one does not need to take a gauge to measure the dust in North-West Kent. Those people who have lived there for at least a quarter of a century say that conditions are worse now than they have ever experienced in that long period ".

Finally, Mr. Irving said that if the Minister could not give the assurances asked for, and there was another heavy fall of dust, the twelve authorities concerned would, in his view, be justified in making an application to him for his consent under Section 92 (1,d) of the Public Health Act, 1936, to take action in the courts to secure an abatement notice.

The Reply

The Parliamentary Secretary to the Ministry of Housing and Local Government (Mr. F. V. Corfield) replied. He said that the Minister fully accepted as justified the public complaint about the heavy fall of dust in October. Emergency measures had been taken which should prevent it happening again.

He would tell the House what had gone wrong. The works which had caused the troubles were fitted with electrostatic precipitators, but they had not been working properly.

Mr. Corfield explained that the clay pits which the two companies concerned had been using for their raw material were near to exhaustion, and increasing amounts of clay had been taken from a new source in the Cliffe marshes. This, and it had not been realized at the time the decision was made, had been affected by the big floods in the early 'fifties. The alkali content was much higher than could have been reasonably anticipated, and this had caused a very substantial increase in the dust content of the waste gases which, in turn, had caused blockage, erratic operation and failure in the precipitators.

A new source of clay, across the estuary in Essex, was now being developed and would replace the unsatisfactory clay, although not entirely for about twelve months. In the meantime the Chief Alkali Inspector had impressed upon the companies the extreme importance of cutting out any avoidable delays, and he would be keeping the closest watch on the progress being made. One works was already back on suitable clay.

There were good grounds for hoping, continued Mr. Corfield, that the emergency measures agreed with the companies would prevent another dust fall such as they had had recently. Up to the last few months the record of complaints had been improving. He went on:

" Something like four million tons of cement are made annually in an area of eight square miles—probably the greatest concentration in the world—and I am afraid that we must face the facts and accept that this concentration rules out the possibility of ever being able to give a complete guarantee of entire freedom from dust nuisance in this area.

Mr. Corfield said that instruments for the steady measurement of the flue gases were still very much in the experimental stage, but he would look into the matter further.

Measurements in Medicine

" Some Epidemiological Contributions to the Etiology and Control of Infection." This is the title of a paper by Professor Robert Cruickshank, Professor of Bacteriology, University of Edinburgh, published in booklet form by the Royal College of Physicians of Edinburgh. It is a study of the use of measurements and statistics in epidemiological medicine, even though the author claims that he is no statistician or mathematician. " Indeed ", he says, " I still rather feel about statisticians what the French lady thought about ghosts. When asked if she believed in them, she said ' No. But I'm afraid of them.' ".

A number of examples of the value of measurement in the investigation of diseases are given, including the case of chronic bronchitis. The relationship of this disease with air pollution is reviewed clearly and succinctly, with particular reference to the study by Reid of the health of post-office workers. The conclusion reached by Professor Cruickshank is that ". . . there is no escape from the predominance of air pollution in the etiology of chronic bronchitis. It therefore behoves all of us doctors to give the strongest support to any campaign for the abolition of air pollution ".

The famous tin of " Fresh English Country Air " referred to on page 97

Divisional News—*concluded*

had the opportunity of inspecting modern heating systems using solid smokeless fuel and gas-fired warm air installations on the premises.

After lunch, by invitation of the Board, the Council visited the Board's industrial research and development section, where they inspected commercial and domestic incinerators, metal melting by the A.R.C.M. furnace, and other items of interest.

Review

MOTOR VEHICLES AND HEALTH

Outstanding U.S. Report

Motor Vehicles, Air Pollution and Health. Report of the Surgeon General to the U.S. Congress. U.S. Dept. of Health, Education and Welfare. Pubd. U.S. Government Printing Office, Washington, D.C. pp. 459, $1.25.

THIS most detailed and indeed massive study is the result of two years' intensive research conducted by the Public Health Service's Division of Air Pollution. It follows legislation introduced in 1960 by Congressman Paul F. Schenck of Ohio, the sole purpose of which was to direct the Surgeon General to

> " conduct a thorough study for the purpose of determining, with respect to the various substances discharged from the exhausts of motor vehicles, the amounts and kinds of such substances which, from the standpoint of human health, it is safe for motor vehicles to discharge into the atmosphere under the various conditions under which such vehicles may operate",

and to present the report note later than two years from the passing of the Act.

It must have been a tough assignment for those who had to do the work, but they have succeeded, and the report is in every way the " thorough " one that was demanded.

The conclusions reached and the recommendations made are, from the nature of the task and the time available, not at all remarkable:

" The adverse effects of air pollution are many and varied—ranging from economic damages, reduction of visibility, injurious effects on crops and animals, to illness and death in people. The precise role of emissions from motor vehicles in producing the adverse effects is far from fully defined.

" Nevertheless, on the basis of the studies thus far conducted, it is evident that components of automobile emissions produce biological effects.

" The results of research conducted to date have provided evidence of a qualitative nature that automobile emissions do produce effects on human being and other biological systems. Further research studies will be required to develop quantitative information on these relationships."

What is more remarkable is the vast amount of information contained in the report, especially as it has had to be compiled and printed within such a limited period. It is in fact a most comprehensive text-book. There are three parts. The first is a summary review of the problem of motor vehicle emissions and their biological effects. Part II discusses and reviews in close detail the effects of motor vehicle pollution on health, and the scope of this section is indicated by the fact that the list of references at the end contains no less than 548 items. Part III, with a mere 168 references, surveys air pollution from motor vehicles—such factors as fuels, operation, nature of emissions, engines, chemical reaction in the atmosphere, control methods and legislation, and so on. A number of recommendations at the end of the section dealing with engine modifications and exhaust emission control, where it is stated that

> "Total exhaust emissions from existing engines can be reduced by use of smaller engines, by novel types of transmissions, by storage of the kinetic energy that can be recovered during deceleration, and by engine shutdown during deceleration and vehicle standstill . . ."

Part II, on the effects of motor vehicle exhaust on health, is in the main a discussion of the far-ranging literature on the subject, which makes the report so useful a reference book. Thus, to take as an example the important constituent of carbon monoxide, we find it discussed under the following headings: Environmental levels; the contribution of automotive emissions; and the effects on health. The last is considered under the subsections: toxicology, the problem of chronic CO poisoning; experimental animal exposures; experimental human exposures; special factors in community exposures; and survey of traffic-exposed persons.

On the kind of approach used, one may quote as an example the first paragraph of the three pages devoted to the possibly most important, but still unresolved, problem of chronic carbon monoxide poisoning:

> " What is chronic carbon monoxide poisoning? Can repeated exposure to low concentrations of carbon monoxide lead to functional or permanent injury in the absence of acute subjective or objective signs of elevated carboxyhaemoglobin levels? Or does chronic carbon monoxide poisoning actually represent light recurrent poisoning, which may grow progressively worse because individual tolerance becomes overstepped with repeated exposure? And do some subjects develop tolerance and others become increasingly sensitive because the former compensate by increased haemoglobin formation, whereas the latter do not or cannot? Unfortunately, the reported cases of ' chronic ' intoxication are usually not the ones in which blood studies are reported."

96·5 per cent of the fuel used for motor vehicles in the U.S.A. is what we call petrol and they call gasolene. Diesel fuel is included in the minor oils that make up the other 3·5 per cent. The special problem we have in the United Kingdom from diesel vehicles is discussed in the report, but only briefly. Attention is naturally concentrated on the major problem. It is thought by many in this country that, while not neglecting our diesel problem, we should give much more attention to the emissions from petrol vehicles, and with an ever-increasing congestion of traffic on our roads and city streets the petrol problem must become more acute and may well lead to a call for special control measures. This important U.S. report will be a most valuable work of reference in any studies that may be initiated here.

ELECTRO-HEAT IN INDUSTRY

" The electrical engineer is unique in having at his disposal several different methods of applying heat for industrial purposes. He can not only generate heat in some device and transfer it to the workpiece by a heat transfer process—the only method open to his fuel-minded competitors—but he can also generate heat within the workpiece itself, and also heat it by a transfer of energy, as in electron-beam bombardment, which is quite distinct from a heat transfer process."

This was said at Southport by Mr. J. T. Sharples, B.SC.TECH., A.M.I.E.E., Industrial Heating Specialist to the Electrical Development Association. He was speaking in the Town Hall on November 6 at the 6th E.D.A. Industrial Development Conference on, " Some Basic Means of Applying Electro-Heat ".

Mr. Sharples said that while this allowed the electro-heat specialist a flexibility denied to his competitors in deciding on the supreme method for the job in hand, it did not make the task of guiding the occasional electro-heat practitioner any easier. Heating problems encountered in industry were of immense variety, even if only the smaller kind of problem was considered. It was difficult to define precisely what was meant by the smaller problem, but his paper assumed that it would be of the kind most usually solved by resistance heating. He was, however, giving some basic data on induction and dielectric heating to enable the occasional practitioner to recognise where these methods might provide desirable alternatives. Such equipment as arc furnaces and vacuum furnaces were considered outside the scope of all but the specialist.

Electric resistance heating came first to mind, said Mr. Sharples, for the solution of the smaller and special kind of heating problem, since it was usually much the cheapest method in capital cost and often led to a higher electro-thermal efficiency than other methods, particularly where the heating current could flow directly through the workpiece, or where resistance heaters could be embedded within, or maintain good contact with, solid charges of good thermal conductivity, *e.g.* metals, or be immersed within a liquid or a gas. There could be no higher electro-thermal efficiency than that given by the immersion heater, using that term in the widest sense.

He then went on to describe the various types of electric resistance heater available for use. Metallic resistance wires, suitably insulated and supported, could cater for temperatures up to about 1,250°C., when operating in air, and for higher temperatures, up to about 2,500°C., when operating in a special atmosphere. Materials such as silicon carbide and molybdenum disilicide could operate in air at up to about 1,550°C. and 1,650°C. respectively, while graphite, in a special atmosphere, could go as high as 3,000°C. A list of the commoner resistance-heating materials and their properties was given in the paper.

Resistance Heaters

Mr. Sharples then turned to special kinds of resistance heater. Metal-sheathed heating elements, he said, had been discussed at a previous E.D.A. Conference, but he had given in his paper a little more information on their use. Finally, there were flexible types of heater embodying a resistance element in a glass or quartz fibre base which was available in tape form, mainly for wrapping around pipes, and as mantles or mats which, because of their flexibility, could be applied to almost any surface which was not subjected to pressure. Flexible surface heaters were in fact in use for heating vessels ranging from glass test tubes to road tankers.

Mr. Sharples said that he would not leave the subject of resistance heating without referring to the possibilities offered by passing a heating current directly through a workpiece. This process could be used in heavy engineering, as for example in the heating of billets for forging, but in relation to the smaller heating problems was more likely to be exemplified by the range of equipment available mainly for soldering and brazing operations.

Mr. Sharples also devoted considerable space to explaining the principles of induction heating and dielectric heating. Induction heating, he explained, could be used only for heating materials, either magnetic or non-magnetic, which were electrical conductors. The heating effect was caused by the resistance of the material to the passage of an alternating current induced in it by an alternating magnetic field surrounding it. On the other hand, dielectric heating was a process applicable only to materials which were not conductors of electricity, and was therefore the converse of induction heating. Another difference between the two methods was that dielectric heating generated heat uniformly throughout a homogeneous material, whereas with induction heating it was concentrated near the surface, the depth of the surface layer in which the heat was generated depending on the frequency of the supply current.

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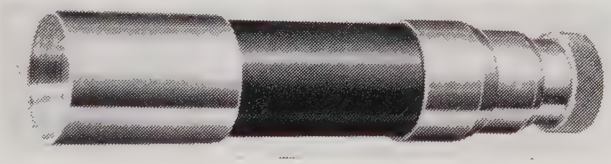

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THE 1958 ALKALI ORDER PROCESSES

*by J. S. Carter, C.B.E.**

Paper Presented at the Harrogate Conference

ONE of the recommendations in the report of the Committee on Air Pollution (Cmd. 9322) was that control of emissions from certain processes where it was known that prevention of air pollution due to smoke, grit and dust presented technical difficulties be entrusted to the alkali inspectorate of the Ministry of Housing and Local Government. Initial powers were included in the Clean Air Act, 1956, Section 17[1] of which made " smoke, grit and dust " a listed " noxious or offensive gas " under Section 27 of the Alkali, &c., Works Regulation Act, 1906. The second and greater step was the coming into effect of the Alkali, &c., Works Order, 1958, giving wide powers of control to the alkali inspectorate in a field where the emissions were not the traditional escapes from the chemical and allied industries, but smoke, grit and dust.

Since this was the first time that such problems were to be tackled on a national scale I felt that there should be a continuing record of the broad administrative and technical approach and of the successes and of the reverses, neither stressing the one nor minimizing the other. To this end in the published annual reports of the chief alkali inspector from 1958 onwards I have given factual progress reports on these newly added processes. My aim is that these reports shall be of guidance and help to students and research workers in years to come. They are a factual record of our stewardship and the alkali inspectorate are prepared to be judged on them.

I propose now briefly to review the generalities of the problems when taken over and then attempt to peer into the future to see what the position is likely to be in a few years' time.

Iron and Steel

The iron and steel industry presented the most difficult of all the chemical engineering problems. The alkali inspectorate assumed responsibility for emissions at a time when fundamental changes were beginning to occur within the industry. It had become generally accepted, but not widely put into practice, that there was need for pretreatment of ores by drying or sintering before feeding them to the blast furnace. The classical open-hearth process still dominated the steel industry, but was being challenged by the newer, pneumatic processes involving the use of oxygen in tonnages undreamed of a few years previously and by its younger rival the electric arc furnace. On the iron founding side the newer hot blast technique was challenging the traditional cold blast cupola.

All of these presented problems in a wide and expanding field and one where existing information and experience were somewhat inadequate and, moreover, one where firm major decisions had quickly to be made. Such decisions were made and have been and are being put into practice. By and large these decisions were sound and there is no reason to be dissatisfied with the rate of progress in the installation of the necessary plant. There are still difficulties, which I make no attempt to conceal, but it would seem that we in this country are on the way to having an iron and steel industry which, both from the viewpoints of technical efficiency and in the means taken to reduce air pollution to the practicable minimum will stand comparison with that of any country in the world. At this stage I acknowledge the progress made as a result of co-operation between industry and the local authorities on the elimination of smoke from the many iron and steel processes which are outside the scope of the Alkali Act.

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* Chief Alkali Inspector, Ministry of Housing and Local Government.

Looking a few years ahead we can take it that clamp calcination of ironstone, a technique specially prone to dust emissions, and which is still operated but on a steadily decreasing scale will have almost disappeared. All plants for ore drying will be adequately de-dusted. Most of the ore fed to blast furnaces will be sintered in plants provided with adequate de-dusting units and with chimneys of height appropriate to the sulphur dioxide emission. Bleeding of uncleaned gases from blast furnaces will cease.

As to steel making the great days of the classical open-hearth process will have gone for ever. Most big works will operate pneumatic processes based on tonnage oxygen. Production types will be Ajax, Kaldo, L-D, Rotor or conventional plants such as open-hearth and electric arc furnaces lanced with oxygen. Details will naturally vary from one works to another. Some will convert molten iron from the blast furnace direct to steel in one operation. Others will operate a two-stage process *i.e.* partial pre-refining by lancing the molten iron with oxygen followed by the completion of the refining in conventional plant. Where the raw material is largely cold metal or steel scrap the route will be to an increasing extent via arc furnaces. Electric arc furnaces will get bigger with possibly 80 to 100 ton furnaces as routine production units for bulk steel.

Pneumatic processes give rise to copious emission of brown fumes and the necessary fume arrestment plant will be bag filtration, electrical precipitation or high efficiency scrubbers to reduce the fume load in the exit gases to 0·05 grain per cu. ft. This is a severe requirement and one about the threshold of visibility, but it is one which can be attained and is being attained.

The most intractable problem and one where no complete solution is yet in sight concerns emissions from bottom-blown Bessemer convertors. Here the problem is more one of containment of the emission than one of treatment. There are such convertors at five works, some of which are likely to cease when modern pneumatic processes are installed. The future of others is uncertain.

Steel and Iron Founding

The steel founding industry has its own problems. The total amount of steel involved is small, but some half million tons yearly compared with about 20 million tons yearly of crude steel production. The main units involved are small electric arc furnaces from 1 to 15 tons capacity, most of which use or will use oxygen at some time or other in the process. Despite their small size there seems no option but to ask them to install the necessary fume plant to obtain the 0·05 grain per cu. ft. limit. Indeed many are in process of so doing. The fume plant is, of course, much smaller. Some of the plants are in well populated areas and the copious emission of brown fume when being lanced with oxygen can cause serious adverse comment.

The least tractable problem of the steel founding industry is that of the Tropenas convertor, which is essentially a small side-blown Bessemer convertor and the problem is largely similar. Before World War II more than half of the steel for castings was produced by this method. The amount is now somewhere between five and ten per cent. The decline is likely to continue as manufacturers change over to electric arc melting. Yet so long as any Tropenas convertor continues to operate there is always the likelihood of public complaint.

Turning to the iron founding industry the main emission problem is that of hot blast cupola. We have agreed with industry on provisional means (arrestment of particulate matter followed by discharge of fume at a height determined by the scale of operations) and in some cases chimneys of 200 ft. or more will be built.

However, some managements have felt these means unlikely in their particular cases to remove all ground for justified complaint and are attempting full fume treatment *e.g.* electrical precipitation, wet washing or bag filtration. The whole matter and especially as concerns the large units is at present being considered by a working party of the industry and the alkali inspectorate.

An interesting iron problem is that of the so-called air furnace used for iron roll casting. The furnace is horizontal with a moveable roof so that scrap rolls, which vary in size from a few hundredweights to some tons can be dealt with. Furnaces vary in size from 15 to 30 tons capacity. Fuel used for melting is usually pulverized coal. At the beginning of each melt there is incomplete combustion of the fuel when it comes into contact with the large lumps of cold iron. A somewhat similar problem is presented by the smaller rotary furnaces of 1 to 12 tons capacity fired by pulverized coal or oil. Here then is the added complication that such furnaces use a good deal of steel scrap which needs recarburizing and methods of recarburization add to the difficulties of dark smoke emission. Complete elimination of dark smoke is not possible and the task is to ensure that the emission is reduced to the lowest amount practicable.

Copper and Aluminium

As to the two non-ferrous metals, coppper and aluminium, the tonnages are but a few per cent. of that for steel production and the national problem is therefore smaller.

Experience with copper works has shown that the registrable processes give rise to rather less emission than do preliminary and ancillary operations such as melting of swarf or blowing to remove zinc. Moreover, there are hazards due to emissions of arsenic, cadmium, phosphorus, etc. not always covered by the definition, which was based solely on smoke emission. It is now proposed to amend the definitions so that the alkali inspectorate can concentrate on the problems of metallurgical fume and on the emission of smoke from the large works, with care of smoke emissions from the casting operations at smaller works restored to the officers of the local authority. The smoke emission problems of the very large works can be serious and despite much research and pilot scale trials no generally applicable solution has yet been found. There are, however, no grounds for pessimism.

Concerning aluminium there is no primary smelting in England and Wales, only the secondary smelting of aluminium *e.g.* recovery from scrap usually by melting with common salt as a flux. The smoke problems are essentially those resulting from use of contaminated scrap and the fume emission problem is largely that of salt fume together with some emission of fluorine compounds from the flux used. The task, therefore, is one of routine chemical engineering, and likely to be solved by application of electrical precipitation or high duty wet washers.

Power Stations

The generation of electric power is an expanding industry. The total generation capacity has more than doubled in the past ten years and as a result of concentration at more powerful stations the total number of power stations has fallen by about one-third. In 1961 a total of some 60 million tons of coal equivalent were burned in power stations in England and Wales and a total of 100 million tons coal equivalent may be reached by 1970, possibly burned at about half the present number of power stations. The new power stations ranging up to 4,000 MW will be fitted with very high efficiency grit arrestment plant and with chimneys of 600 to 650 feet. The dominant problem here is that of adequate dispersal of sulphur oxides. The geographical pattern of electricity consumption is vastly different from that of coal production. The southern half of the country produces little coal yet consumes nearly half of the electricity generated. There are also coal deficiencies in parts of the north-west. The crucial question is whether coal should be moved to the deficient areas or whether electricity should be transmitted. A partial answer is possible by siting oil-fired and nuclear power stations in the coal deficient areas. Siting of oil-fired stations is, however, determined in large degree by proximity to major oil terminals and refineries.

It is somewhat ironical after speaking of these huge new power stations to state that the power stations most productive of complaint are the very small stations (pygmy by modern standards) which present a problem out of all proportion to their size. Nearly all of them date from a time when standards of grit arrestment, etc. were lower than those acceptable to-day. However, the recent almost dramatic upsurge in demand for electricity has required their short-term operation, usually in periods of cold weather. Although their power generation is to be recorded in days yearly rather than in weeks, nonetheless they draw severe adverse attention to themselves when operating. It was the view of the Committee on Air Pollution (Cmd. 9322), and one which I had regarded almost as an instruction, that such power stations should cease to operate by 1964. The Central Electricity Generating Board have indeed collaborated and some 70 stations with a total capacity of about 800 MW have been closed over the past few years. Demand for electricity is, however, such that it is necessary to retain in service some of these small old generating plants to assist in meeting peak demands especially over the difficult period 1963/66. We shall do all that is practicable to ensure that emissions therefrom are kept to a minimum and are in close touch with the Board on this facet.

Gas

The importance of producer gas in industry continues to decline. About a third of the plants which were registered in 1958 have already ceased to operate and the number is likely further to fall. The present tendency is to go over to other methods of firing *e.g.* oil, especially as plant becomes due for overhaul or replacement. Nonetheless, there still remains plant with useful life before it and likely to be used for some years to come. In collaboration with the industries concerned we are getting out a code of practice so that during this final period smoke emissions can be kept as low as possible. The major problem here is that of dark smoke emissions on " burning-out " of mains.

As to the gas industry, concentration of operations continues, there being now operative but one-third of the number of works of a few years back and even under these conditions about one-quarter of the works operating produce three-quarters of the gas made. As will be appreciated concentration at fewer and larger works aggravates some problems. On the other hand larger works usually have better facilities for technical control and a greater proportion of modern plant. The gas industry is indeed one which is at the crossroads. It is the view of many in the industry that the last conventional coal carbonization plant has been built and that the industry's future lies in processes for the complete gasification of coal by Lurgi and related techniques and by gasification and reforming processes based on liquid and gaseous products of petroleum refining.

It is unnecessary to remind a gathering drawn appreciably from the industrial north of the many and serious emission problems of the coke oven industry. They are reviewed at length in the 97th alkali report for 1960 and it must here suffice to say that so long as coke ovens exist they will present one of the most formidable tasks facing the alkali inspectorate.

Ceramic Processes

Numerically the largest class of works added by the Order of 1958 came from the ceramic industry. Save for certain special products *e.g.* Staffordshire blue bricks, taking a long term view, the ceramic industry must eventually become largely smokeless by normal processes of technical evolution. This is, however, looking quite a few years ahead.

Progress is most rapid in the pottery industry where at one time the smoke from the old fashioned traditional bottle ovens produced a pall over Stoke-on-Trent. These are steadily disappearing and are being replaced by smokeless methods of firing which are, of course, under the control of officers of the local authority under the Clean Air Act. In 1938 there were some 2,000 coal fired operable bottle ovens in the Stoke-on-Trent area. When the Alkali Order became operative in June, 1958 there were 295. By December, 1959 the number was 222, by December, 1960, 157 and by December, 1961, it had fallen to 95. The direct interest of the alkali inspectorate in smoke from the pottery industry is thus rapidly reaching vanishing point.

Three special sections of the heavy clay industry, blue engineering bricks, salt-glazing of earthenware and Fletton bricks, all largely localized in a few areas, have their own special emission problems. The blue engineering brick problem is that of dark smoke, the blackness of which has to be seen to be believed; the salt-glazing emission is essentially that of acid fumes combined with a copious white salt emission, and the Fletton emission is that of an offensive smell with an emission of fluorine compounds which gives rise to an agricultural hazard. These problems are discussed at some length in the published alkali reports.

If firing is carried out in continuous kilns, and especially in top-fired continuous kilns, there is little or no serious problem of smoke emission. Indeed four-fifths of the output of building bricks is already fired in continuous kilns with in general but little smoke production. This may well be the ultimate solution although some intermittent kilns may have to be retained for certain special products. Meantime the national smoke problem relates mainly to the 3,000 or so intermittent kilns. These are mostly small and with chimney heights which are inadequate. At the moment but one-fifth of these kilns are fitted with mechanical stoking or oil firing. Some form of continuous firing is probably essential if smoke is to be reduced to the minimum. The problem is however less simple than might appear at first sight. It is not solely a combustion problem and the desiderata for boiler firing do not necessarily apply. There is much ceramic technique to be considered. Similar kilns may be doing different jobs ceramically and the wastage factor in production must be watched. Products are many and diverse, with art, science and trade habits closely interwoven. Quality of a particular product is almost sacrosanct. Nonetheless, conditions cannot be allowed to remain as they are.

Lime Works

The remaining processes added to the Schedule by the 1958 Order are relatively few. As to lime works, this is a small industry the national coal consumption being but that of a single medium-sized power station. Complaint on the score of dark smoke is justified and appreciable. The real problem concerns the coal-fired shaft kilns in the northern half of the country which produce the high quality limes which certain industries demand. The technical problem is that of trying to burn coal smokelessly in an atmosphere largely of carbon dioxide and nitrogen. The economic problem is that lime is probably the lowest priced of the basic chemicals. The task is indeed difficult but there are no grounds yet for writing it off as hopeless. Other qualities of lime are produced elsewhere by processes which are virtually smokeless using coke or blast furnace gas as fuel and which are the concern of the local authority.

The remaining processes, sulphate reduction, caustic soda and chemical incineration, together involve a mere dozen works and are therefore of but local interest only.

Although there are still technical pockets of resistance to be overcome

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MORE FOR THE BOOKSHELF

Important New Publications

A biggish stack of new books and reports relating to air pollution has been received in recent weeks, ranging over a wide field. We think that every reader will find one or more to be of direct interest to him or her.

Epidemiology of Air Pollution. Report on a Symposium. By P. J. Lawther, A. E. Martin and E. T. Wilkins. pp. 32. World Health Organization, Geneva, 1s. 9d.

This is a report of a WHO symposium held in Copenhagen in December, 1960, attended by participants from 14 European countries. It is in the form of short papers surveying the problem under the headings of: nature of air pollution; measurement; medical studies; epidemiological studies, with some results; and conclusions. The material on which the report is based has for the most part been previously published and discussed but the booklet is a most useful and compact review of the ground it covers, and the concluding sections on epidemiological studies are a particularly good summary of this important research. The report is reviewed at length in the November, 1962, issue of *WHO Chronicle.*

Air Pollution. Edited by Arthur C. Stern. In 2 vols., pp. 656 and 586. Academic Press, New York and London. Vol. I, 143s., Vol. II, 132s.

We have now received our own review copies of these two volumes, which were reviewed in verse in our last issue (p. 61) by Professor R. S. Scorer. For a critical assessment of the work we do not think we can, or need, add to his pungent rhythms, but will briefly note the contents of the 1,248 pages. The book, in brief, is a symposium of articles by 45 authors, ably edited by Arthur Stern of the Robert A. Taft Sanitary Engineering Centre, U.S. Public Health Service.

The first volume has three parts: air pollution and its dispersion, the effects of pollution, and the measuring and monitoring of air pollution. In volume two there are five parts: air pollution sources, control methods and equipment, air pollution control, and air pollution literature sources. In addition there are appendices and author and subject indexes.

As with any other such encyclopaedic work, parts will be of interest to everyone concerned with air pollution, but everyone will also find there are those which must be of interest to someone else. The contributors naturally have an American background, which is sometimes different from our own, though a great deal is of universal application. Thus there is nothing on domestic problems, such as we know them, except a brief statement about a serious demand for open fires, mainly for decorative purposes, in the U.S.A. The sections dealing with legislation and administration, etc., although of much interest, have little that can assist us over here. On the other hand—to pick an item by random—the section on electrostatic precipitators would be helpful to readers in Bristol, Baltimore or Brisbane.

Perhaps one of the most useful contributions is that by Stern himself, on " Air Pollution Standards ". This is most comprehensive and international in character, and forms a valuable guide and source of reference. So much so that one wishes it was available as a slim monograph (48 pages), which could obtain a wider circulation than being merely a small part of a large and expensive book. This may well be the case with a few other contributions, and it prompts the thought that the publication of a series of monographs might be a better service to the movement for air pollution control, than can the tome which deals with everything. For one thing, it is easier to revise a monograph when it becomes out-of-date.

Smoke Inspector's Handbook: One. Arthur Coe and Ian M. Coe. pp. 192. Clean Air Information Service, College of Fuel Technology, London. 35s.

This useful and workmanlike text and reference book is published in typescript reproduction with hard cover and spiral binding. It covers a great deal of ground and, in the industrial section, has numerous illustrations and diagrams. It begins with a full review of the Clean Air Act and describes its sections in some detail. Then follow 17 chapters on fuels, combustion, boiler house practice, firing methods and chimneys.

The book is refreshingly practical and not infrequently critical of some accepted practices and assumptions, as for example in its discussion of chimney heights. There is a full and well-arranged index, which will be particularly valuable for quick reference.

We understand that a second part is to be published shortly, covering matters not included in the first volume. These range, for example, from water-tube boilers and pulverized fuel boilers to wood burning, brick kilns and colliery spoilbanks.

The Modern Uses of Solid Fuel. A Study in Domestic Heat Services. Kathleen V. Bradbury. pp. 192. Published for the Women's Advisory Council on Solid Fuel by Educational Productions, London, 18s.

This book has been prepared especially for housecraft teachers, demonstrators and students, but it should be of value to other readers. It deals comprehensively with its subject, and technical matters are not shirked but are explained in a simply and lucid, but perfectly adequate, way. Coal is treated as just one of the solid fuels, and it is interesting to note that whereas not many years ago it would have had the lion's share of attention it now falls into line with its smokeless alternatives, and naturally falls out altogether when smoke control areas

What the U.S.A. has to cope with. Reproduced from a report on air pollution from Utah is this picture of the burning of waste materials in the State are being discussed. Altogether a sound, pleasantly written and recommendable book.

8th Progress Report. National Industrial Fuel Efficiency Service. For the Year ended March 31, 1962. Pp. 48. NIFES, London.

This new report of the excellent work continuing to be done by NIFES must give much satisfaction to its Chairman, Sir Leslie Hollinghurst, and his colleagues. The first item to be mentioned in the report is a substantial increase in earnings, which has made it possible for the sponsors, who have so generously supported NIFES since its inception, to reduce their contributions. During the year 68 per cent. of the £450,000 guaranteed was drawn, while revenue from fees and charges was £244,876. This seems most substantial, and the number of clients during the year, 1,428, also seems substantial. But compared with the number of companies and works in the country, and the proportion that would be likely to benefit from the help that NIFES could give them, there is clearly scope for much expansion.

The report states that there is in fact a reduction in demand for the improvement of boiler efficiencies, but an increase in demand for advice on the more effective utilization of heat, either in process operations or in space heating.

Under the heading " How NIFES Assists Industry ", a major part of the report gives case histories of typical jobs that have been done. One's eye falls on such conclusions as: " The annual saving in heat and power costs amount to £4,100, or 32 per cent." " After carrying out NIFES recommendations 32 per cent. more steam was produced for only a 9·5 per cent. increase in fuel consumption." ". . . our fuel bill was £3,857 as against £4,170 in the preceding twelve months . . . but . . . our production in the year was some 30 per cent. higher . . ." And so on.

Reactor Safeguards. Charles M. Russell. pp. 390. Pergamon Press, Oxford, New York and Paris. 80s.

This book is one of an International Series of Monographs on Nuclear Energy being published by the enterprising Pergamon Press. The author is American and has served as Secretary of the Reactor Safeguards Committee and its successor. He points out in his foreword that the rapid expansion of the atomic energy programmes with several dozens of reactors in operation has led to the development of well-organized procedures for hazards valuation, licensing and inspection as required by regulations. The book contains information that has been accumulated over several years and used for lectures at the North Carolina State College.

The author examines radioactive materials and reactor kinetics, and passes on to a discussion of control and safety systems and containment. Safety features of water reactors, the dispersion of radioactive material, extent of possible damages, and site requirements are the subjects of following chapters. Finally, apart from appendices, there is an account of practical operating experience, and of a number of incidents or accidents.

This is a book that will be of considerable value to all who are concerned with reactors or who seek to have more knowledge about a new question that may become of concern to them.

The 1958 Alkali Order Processes

—concluded

e.g. the Bessemer converter and the blue brick industry smoke, and although certain older plants, notably some sinter units and some of the smaller electric power stations, leave a good deal to be desired, nonetheless, there are good and reasonable hopes that the next few years will see the solution of most of our industrial pollution problems due to smoke, grit and dust, and that presumably this will be the first country where this has been achieved.

Octavia Hill

Pioneer for Clean Air

The 50th anniversary of the death of Octavia Hill was commemorated by a number of articles in the October, 1962, issue of the Quarterly Journal of the Society of Housing Managers. One of these, by the Director of the N.S.C.A., was on the part played by Miss Hill in the early days of the smoke abatement movement. As it may also be of interest to our own readers it is here reprinted, with acknowledgments to the S.H.M. Journal.

THE National Society for Clean Air has some records of the history of the smoke abatement—now called clean air—movement, but these are unfortunately far from complete. We know how attempts were made, as early as the 13th century, to prohibit the use of the new smoky sea-coal in London, and we have republished John Evelyn's now classical pamphlet of 1661, "Fumifugium; or the Smoake of London Dissipated". But we have little about the background to the growth of public opinion during the 19th century, out of which has grown our present legislation, our understanding of the problem, and the NSCA itself.

The invitation to write about Octavia Hill and smoke abatement at first seemed difficult to accept, for there was nothing about her in our own records. But it was pointed out that there was some information in E. Moberly Bell's biography, and this has proved to be not merely helpful in writing this article, but valuable in filling a gap in our knowledge of the story of the smoke abatement movement.

We knew that the inspiration for smoke abatement in the 1880s came from a body called the Kyrle Society, but we did not know that the inspirer of the Kyrle Society, in relation to smoke abatement, was one of its founders, Octavia Hill.

Octavia Hill

It all started, according to Miss Bell, with Octavia's European journey and sojourn in Nuremburg in 1880. This, to quote Miss Bell, "opened her eyes to an English abuse"—much perhaps as his travels in Italy opened the eyes of John Evelyn two hundred years ago and has since opened the eyes of many others who, having seen clean cities elsewhere, have been leaders in the campaign. Octavia wrote:

> "Trees grow among the houses, and children play around them, and clean industrious women knit at their doors . . . and still these gardens for the people look reproach at me, when I think of England; every tree and creeper and space of green grass in the town reminds me of our unconsumed smoke, and how it poisons our plants and dims the colour of all things for us."

One of the difficulties in the way of smoke abatement has always been that those who live in polluted air become accustomed to its dirt and gloom and accept it all as part of the natural order of things. There is a degradation of standards and sensibility, and it takes the shock of the contrast of a clean environment to open the eyes—and the mind—to the facts. (For a brilliant discussion on this, in a wider context, see Lewis Mumford's " Technics and Civilization ".)

So Octavia came back from the clean air she had experienced, and communicated her enthusiasm to the Kyrle Society:

> " It appeared a natural sequel ", she wrote, " to what we had tried to do to secure open spaces, when once the world seemed awakening to the necessity of obtaining them, to endeavour to make them such as trees and flowers and grass would grow in and show their natural colour and brightness."

A sub-committee for smoke abatement was formed by the Kyrle Society, and it was decided to direct public attention to the problem by holding a Smoke Abatement Exhibition. The Public Health Society was interested, and a joint committee of the two bodies was set up to organize the exhibition. Miss Bell records that on this " Octavia worked hard ".

For a full account of this exhibition we have an excellent article on smoke abatement published in the *British Almanack* for 1884. It was held in South Kensington, in the old 1851 Exhibition buildings, and was attended by 116,000 people. Its object, we read, " was to enable the public to inspect, and, as far as possible, see in action, the various appliances available for the consumption of fuel for heating, cooking and manufacturing purposes, in an economical and sanitary manner ".

An important feature was the testing of grates, stoves and furnaces for their ability to prevent or reduce smoke. This work was supervised by a committee of " eminent scientific men ", and the results were afterwards published in a report. The South Kensington exhibition was followed by a similar one in Manchester, organized by the Noxious Vapours Abatement Association of that city. The minute books of this body are still in existence and they show that an inquiry was made about the financial aspects of the South Kensington event—expenses had totalled £2,476, and receipts, largely " gate money ", £1,522.

It is recorded that these exhibitions did a great deal of good, and they certainly stimulated public opinion, for in July of the following year, 1882, a public meeting was held in the Mansion House, at which it was agreed that a National Smoke Abatement Institution be formed. This was done, and we learn that it had " a distinguished and representative Council ".

Little is known about this Institution, although there is a printed report of a meeting it held in 1883, again at the Mansion House, and with the Lord Mayor in the Chair. From the list of those present it was a decidely " U " affair. Whether Octavia Hill was there, or whether she had any active interest in the Institution, we do not know. Although the Lord Mayor addressed the meeting as " ladies and gentlemen ", only one lady is mentioned by name—the Duchess of Westminster.

The only other record about the Institution is a report of a meeting held about 1887, at which a lecture was given by the Hon. Rollo Russell, with Lord Stratheden and Campbell in the Chair. This was on smoke in relation to the fogs of London, and was a sound and well-informed review of the problem. It is also notable for the first attempt to estimate the economic cost of smoke. The last was made by the Beaver Committee in 1954. Mr. Russell carefully itemized all the factors and found that smoke cost London about £5 millions a year. The Beaver Committee's total was £250 millions for the whole country.

In addition to considering the need to develop industrial furnaces and appliances for burning coal smokelessly, or at any rate with less smoke, these early exhibitions and meetings recognized the seriousness of the domestic coal fire and cooking range. Efforts were made—which have continued, unsuccessfully, on and off until today—to design domestic grates and stoves to burn coal without smoke. The possibilities of gas, and perhaps a special non-illuminating kind of gas (which we now have) were considered. The potentialities of electricity were not realized, but coke and other smokeless fuels, and even oil, were regarded as possible alternatives to bituminous coal.

The technical requirements for real advances were not however available in the 1880s, and the campaign for domestic smoke abatement languished. On the industrial side there was already legislation—chiefly in the Public Health Act, 1875—as Octavia found to her surprise when she became interested in the problem, writing: " The law *does* forbid smoke, so far as it can be prevented, issuing from factories large and small, from steamboats, and from all chimneys other than those of private houses ".

She went on, making a point that it has taken until the present day to get across to some industrialists:

> " The saving ought to be enormous, the smoke all consists of unconsumed fuel. Some scientific men say that as much as three million out of five million tons used annually flies away in smoke, and so does harm and not good."

In brief, the law was not very effective, was not used as widely as it could have been, and was regarded by many in industry as an unwarranted interference. The idea that " where there's muck there's money " was firmly entrenched.

The Next Phase

There is gap in the records between 1887, the year of the last known activity of the Smoke Abatement Institution, and 1899, when things began to move again. The Institution must have come to an end, no doubt because of lack of popular support and the difficulties of framing a positive programme for reform.

In 1899 a new Coal Smoke Abatement Society was formed in London. It was headed by a London physician, Dr. Harold Des Voeux, an artist, Sir William Richmond, R.A. and one or two scientific advisers. With Richmond as President and Des Voeux as Treasurer the Society set to work, quietly, with many frustrations, and yet in the long run with steady progress. After a few years it engaged as part-time secretary Lawrence Chubb, who had been the first secretary to the National Trust, and was secretary of other bodies, including, much later—and then as Sir Lawrence—the National Playing Fields Association. Also, a little later, came as an invaluable technical adviser, Dr. R. Lessing—who is still playing an active part and was a member of the Beaver Committee.

The new Society began to grow out of the stage of being regarded as a set of cranks, initiated a number of new and practical ideas, and pressed for a Government inquiry into the problem and its cure. This was eventually agreed to, and although held up by the 1914 war, a departmental committee, with Lord Newton as its chairman, was set up in 1919 and presented a report in 1921. New smoke abatement legislation was won in 1926, although because of opposition from industry it was far from being as strong as it should have been.

By this time the Society was being aided by an ally from the provinces, the Smoke Abatement League of Great Britain, which was centred in Manchester. In 1929 the two organizations agreed to amalgamate, and became the National Smoke Abatement Society. Des Voeux and Chubb were still towers of strength in London, the former becoming President of the new Society. In Manchester, among the leaders were a business man and city alderman, Will Melland, and a barrister, Charles Gandy (who later conceived the brilliant idea of smokeless zones). They had appointed a full-time secretary—the present writer—and in 1936 headquarters went back to London, where progress continued. Interrupted, of course, by the 1939 war, the work of the Society expanded greatly afterwards, and clean air began to be an accepted policy in the post-war inquiries and reports on housing, domestic heating, domestic and industrial fuel policy, and so on.

Then, in December, 1952, came the great London smog, which led to 4,000 deaths attributable to what was a heavy and sudden concentration of the normal pollution. There had been many other fatal smoke fogs and this was exceptional only in its severity. It acted as a powerful stimulus for more urgent action. A new Government inquiry was started (the Beaver Committee), and in 1954 came a forthright report and recommendations. These endorsed the case for clean air that had been built up by the NSCA, and they were followed by new legislation: the Clean Air Act, 1956.

This Act is a great advance on the earlier legislation, and although this is not the place to describe it in detail it can, very briefly, be said that it aims to control and firmly cut down smoke from existing industrial plant, to ensure that new plant is smokeless, to control dust and grit emissions, and for the first time in any national legislation, to abolish domestic smoke by smokeless zones, or what the Act calls smoke control areas. These are to extend, stage by stage, until the whole of our towns and conurbations are freed from smoke.

The Act is succeeding, and there are now over 600 smoke control areas in being. Much more remains to be done, and the pace of progress is slower than it might be, but nevertheless progress is steady and the next decade will see the end of the smoke problem at hand. We have advanced a long way since Octavia Hill came back from Nuremberg with a vision of the beauty, colour and cleanliness that should be possessed by every town and city in Britain.

THE PROBLEMS OF BRONCHITIS

Guildhall Conference

With the title " First Aid in Bronchitis " the Chest and Heart Association held a well-attended conference in the Livery Hall, Guildhall, London, on October 17. There were ten papers or addresses and the chairman was Mr. Stanley E. Cohen, F.R.S.H., Chairman of the Port and City of London Health Committee—and of course Hon. Treasurer of the National Society for Clean Air.

Only one or two of the contributions had a direct bearing on the connection between air pollution and bronchitis, the principal one being by Dr. Llewelyn Roberts, Medical Officer of Health for Sheffield. Dr. Roberts said he was in some doubt about the title given to his address, which was " The Value and Limitations of Smoke Abatement ", because, he said, he could not think of any limitations. There might be difficulties, but not limitations.

Dr. Roberts referred to Sheffield's first smoke abatement legislation, which was obtained in 1818. He said that there had been big changes in the city during the past twenty years, and spectacularly so since the Clean Air Act. The health education campaign they had carried out had had valuable results.

Smoke abatement, continued Dr. Roberts, was part and parcel of town planning, with which it should be integrated. The Act opened up new vistas. There was, however, an increasing amount of sulphur dioxide in the air and the next effort should be to remove this and to secure stricter limits for grit and dust emissions. On the domestic side Dr. Roberts said he wanted to see more compulsion from the Government for extending smoke control areas, and said that housing improvement grants should cover new heating appliances.

SMOKE CONTROL AREAS

Progress Report

POSITION TO 1 OCTOBER, 1962—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation . . Acres, 3,400 Premises, 41,060	44	1
Smoke Control Areas in Operation . . . . Acres, 161,673 Premises, 898,261	799	24
Smoke Control Orders—		
Confirmed	224	9
Submitted	129	5
Grand Totals	1,196	39

The lists given below are supplementary to the information in the last issue of *Smokeless Air* (Autumn, 1962) which gives the position up to July 1, 1962. They now show the changes and additions to October 1, 1962.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Orders in Operation

Aldridge U.D. Nos. 7 to 13, Ashton-under-Lyne B. No. 3, Barnet U.D. No. 3, *Batley B. Nos. 1 and 2, Bebington B. Nos. 3 to 7, Beddington and Wallington B. No. 2, Bermondsey M.B. No. 4, *Blackburn C.B. No. 1, Bolton C.B. Nos. 16 to 18, Bredbury & Romiley U.D. No. 2, Brighouse B. No. 6, Bury C.B. No. 3, Camberwell M.B. No. 2, Cambridge B. No. 1, Carlton U.D. No. 1, *Carshalton U.D. No. 2, *Cheltenham B. No. 1, Cheshunt U.D. No. 2, Chesterfield R.D. No. 2, Church U.D. No. 2, Colne B. No. 1, Coventry C.B. No. 3, Crewe B. No. 1, Dartford B. No. 2, Deptford M.B. No. 3, Dewsbury C.B. No. 4, Doncaster C.B. No. 6, Dudley C.B. No. 4, Ealing B. No. 7, East Barnet U.D. No. 3, Eccles B. No. 3, Edmonton B. No. 4, Feltham U.D. No. 2, Finchley B. No. 6, Finsbury M.B. No. 2, Friern Barnet U.D. No. 2, Fulham M.B. Nos. 5 and 6, Grantham B. Nos. 3 to 6, Greenwich M.B. No. 3, *Halifax C.B. No. 4, Harrow B. No. 2, Hayes & Harlington U.D. Nos. 17 and 21, Hebburn U.D. Nos. 2 and 3, *Heckmondwike U.D. No. 2, Hendon B Nos. 2 and 3, Heston & Isleworth B. Nos. 3 and 4, *High Wycombe B. No. 10, Hyde B. Nos. 2 and 3, Islington M.B. Nos. 5 and 6, Kensington M.B. Nos. 5, Kington-upon-Hull, C.B. No. 9, Kingston-upon-Thames B. Nos. 1 and 2, Leicester C.B. No. 7, *Leigh B. No. 1, Lewisham M.B. Nos. 9

to 11, Leyton B. No. 2, Lincoln C.B. No. 1, Malden & Coombe B. Nos. 1 and 2, Manchester C.B. No. 5, Merton & Morden U.D. Nos. 1 and 2, Middlesbrough C.B. No. 2, Newcastle-upon-Tyne C.B. No. 4, Oxford C.B. No. 3, *Paddington M.B. No. 3, Penge U.D. No. 1, Pontefract B. No. 2, Poplar M.B. Nos. 7 to 13, Pudsey B. No. 3, Richmond (Surrey) B. No. 3, *Rochdale C.B. Nos. 3 and 4, St. Marylebone M.B. No. 5, Sale B. No. 3, Salford C.B. No. 5, Shoreditch M.B. No. 4, Slough B. No. 2, Smethwick C.B. No. 4, Southgate B. No. 2, Stepney M.B. No. 3, Stockport C.B. Nos. 3 and 4, Stoke Newington M.B. No. 7, Stretford B. No. 2, Swinton & Pendlebury B. No. 2, Todmorden B. No. 1, Twickenham B. No. 1, Urmston U.D. Nos. 1 and 2, Wakefield C.B. Nos. 3 and 4, Walsall C.B. No. 4, Wanstead & Woodford B. No. 3, Wembley B. Nos. 2 to 5, Westhoughton U.D. No. 2, Westminster M.B. Nos. 6 to 8, *Whitefield U.D. No. 3, Willenhall U.D. Nos. 10, 12 and 13, Willesden B. No. 4, Wilmslow U.D. Nos. 2 and 7, Winsford U.D. No. 3, Wolverhampton C.B. Nos. 2 and 3, Woolwich M.B. Nos. 9, 13 and 14.

New Orders Confirmed but not yet in Operation

Acton B. No. 5, Aireborough U.D. No. 11, Bermondsey M.B. No. 5, *Blaydon U.D. No. 1, Bradford B. No. 4, Brentford & Chiswick B. No. 3, *Chadderton U.D. No. 4, Chatham B. No. 2, *Crawley B. No. 3, Dagenham B. No. 4, Derby C.B. No. 2, Doncaster C.B. No. 7, Droylsden U.D. No. 2, Ealing B. Nos. 10 and 11, Ellesmere Port B. No. 5, *Exeter C.B. Nos. 3 to 6, Finsbury M.B. No. 3, Glanford Brigg R.D.C. No. 1, Hackney M.B. No. 5, Halesowen B. Nos. 13 to 17, Hammersmith U.D. No. 4, Harrow B. No. 4, *Hazel Grove & Bramhall U.D. No. 1, Heckmondwike U.D. No. 3, Hendon B. No. 4, Heywood B. No. 3, Horbury U.D. No. 1, Horsforth U.D. Nos. 9 to 13, 15 and 16, Irlam U.D. No. 2, Knottingley U.D. No. 4, Lambeth M.B. No. 2, Leeds C.B. Nos. 20 to 22, *Leigh B. Nos. 2 and 3, Letchworth U.D. No. 1, Malden & Coombe B. No. 3, *Mansfield B. No. 2, Nottingham C.B. No. 3, Oldbury B. No. 2, Padiham U.D. Nos. 3 and 4, Prescot U.D. No. 3, St. Pancras M.B. No. 4, *Salford C.B. Nos. 6 and 9, Scunthorpe B. No. 3, Smethwick C.B. No. 5, Solihull B. No. 3, Southgate B. No. 3, Spenborough B. No. 3, Stoke Newington B. No. 8, Stoke-on-Trent C.B. No. 12, Stretford B. No. 3, Twickenham B. No. 2, Wakefield C.B. No. 5, Wallasey C.B. No. 7, Wallsend B. No. 2, *Walthamstow B. Nos. 3 and 4, Wandsworth M.B. No. 4, Wednesbury B. No. 2, Westhoughton U.D. No. 1, Willenhall U.D. No. 14.

New Orders Submitted for Confirmation but not yet Confirmed

Aldridge U.D. Nos. 14 and 6, Barnet U.D. No. 4, Battersea M.B. No. 3, Bingley U.D. No. 4, Birmingham C.B. Nos. 64 to 80, Blackburn C.B. No. 3, Blaydon U.D. No. 2, Carshalton U.D. No. 3, Chesterfield B. No. 4, Colne B. No. 2, Denton U.D. No. 6, Deptford B. Nos. 4 and 4A, Derby C.B. No. 3, Droylsden U.D. No. 8, Dudley C.B. No. 5, Ealing B. No. 12, Edmonton B. No. 5, Feltham U.D. No. 3, Finchley B. No. 7, Gravesend B. No. 1, Greenwich M.B. Nos. 4 and 5, Harlow U.D. No. 3, Hemel Hempstead B. No. 3, Hendon B. No. 5, Heywood B. No. 4, High Wycombe B. No. 11, Huyton-with-Roby U.D. No. 3, Ilford B. No. 3, Islington M.B. Nos. 9 and 10, Kensington M.B. No. 6, Kirkby U.D. No. 3, Leeds C.B. No. 23, Leicester C.B. Nos. 8 and 9, Lewisham M.B. Nos. 12 and 13, Liverpool C.B. No. 15, Morley B. Nos. 19 and 20, Newcastle-upon-Tyne C.B. No. 7, Nuneaton B. No. 7, Ossett B. No. 4, Padiham U.D. No. 5, Penge U.D. No. 2, Prestwich B. No. 6, Queensbury & Shelf U.D. No. 2, Radcliffe B. No. 2, Richmond (Surrey) B. No. 4, Rotherham C.B. No. 11, Runcorn U.D. No. 2, St. Marylebone M.B. No. 6, Sale B. No. 4, Sedgley U.D. No. 7, Sheffield C.B. No. 10, Slough B. No. 4, Stalybridge B. No. 6, Stourbridge B. Nos. 1 to 17, Thurrock U.D. No. 2, Todmorden B. No. 2, Tynemouth C.B. Nos. 1 to 5, Wakefield C.B. No. 6, Wallasey C.B. Nos. 8 and 9, Walthamstow B. No. 5, Wembley B. Nos. 6 and 7, West Bromwich C.B. Nos. 10 and 11, West Hartlepool C.B. No. 1, Widnes B. No. 2, Wilmslow U.D. No. 11, Wimbledon B. No. 2, Woolwich M.B. No. 15, Worsley U.D. No. 3.

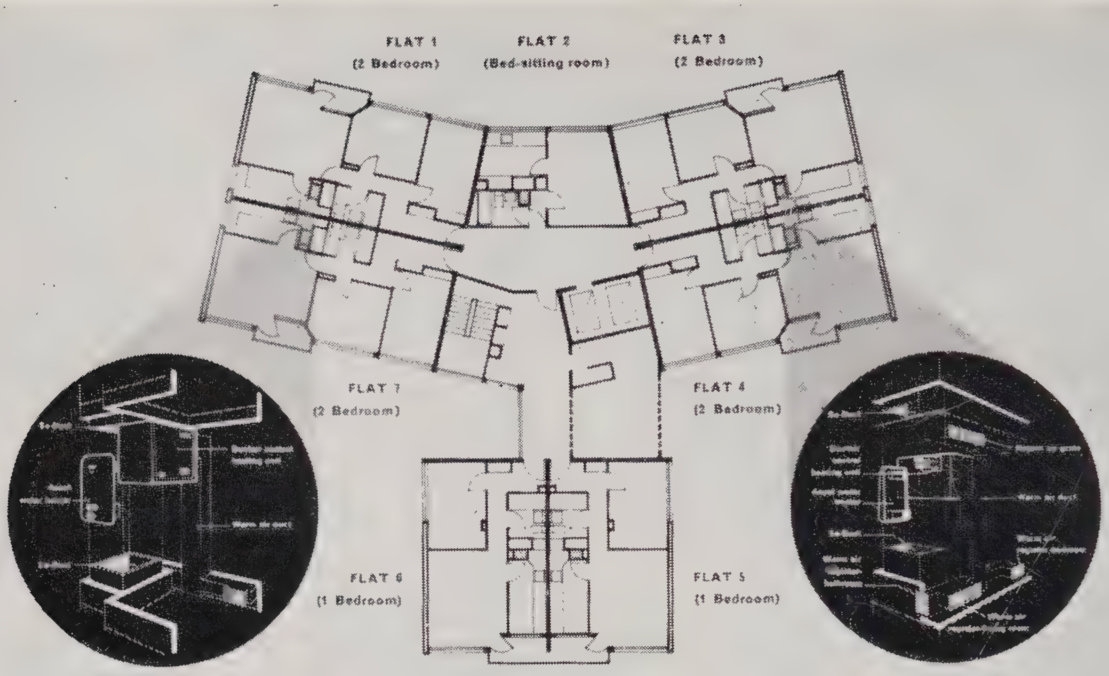
SCOTLAND

New Smoke Control Orders in Operation

*Dumbarton Burgh No. 2, Grangemouth (Bowhouse No. 1), *Paisley (Foxbar).

New Orders Submitted for Confirmation but not yet Confirmed

Paisley (Glenburn).



Detail of Ductair and Ascot appliances connected to Se-Duct—FRONT VIEW

FLOOR PLAN

Detail of Ductair and Ascot appliances connected to Se-Duct—REAR VIEW

Gas Central Heating in New Flats

Shown here is the plan of a complete floor of Temple Court, Southend Corporation's new 11-storey block of flats at Pantile Avenue.

Inset are front and rear-view diagrams of the arrangement of the gas-fired Ductair G 105/23 warm air central heating unit and Ascot 727 instantaneous multipoint gas water heater connected to a common Se-Duct from which air for combustion is drawn and into which products of combustion are expelled.

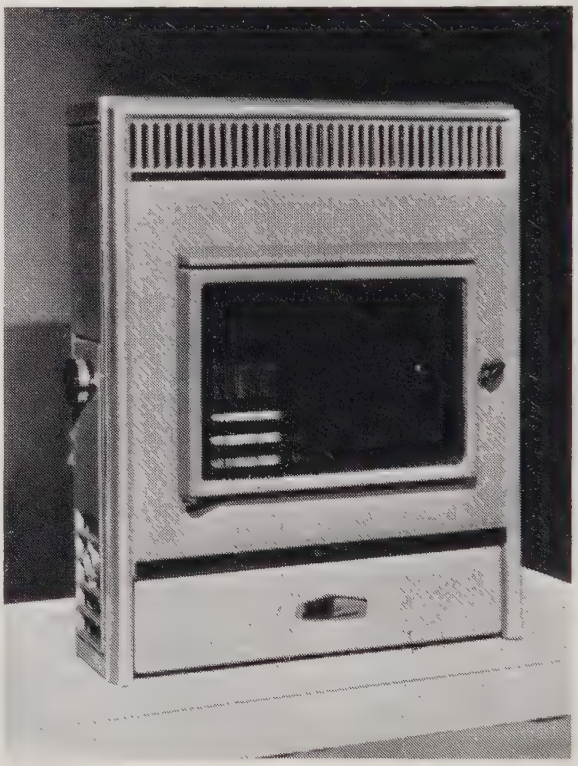
The Se-Duct system, now widely used to meet the problem of flueing in multi-storey buildings, was developed to enable space heaters, water heaters and other gas-fired appliances to be connected to a common flue. It reduces installation costs, increases floor space and enables these specially designed appliances to operate at high efficiencies.

The New Fuel

Test samples of the much-discussed N.C.B. " premium " smokeless fuel, not yet officially named but referred to as " Bronowski's Bullets ", have been sent out recently on a wide scale. From our own observations and comments heard we gather that the verdict will be very favourable.

A NEW CLOSABLE STOVE

Below is shown the new Rayburn " Princess " stove. It will heat a room up to 3,000 cu. ft., or with back boiler will heat three or four radiators, plus room heating up to 2,000 cu. ft.



GOOD PROGRESS BY GAS

1961–62 Report Published

The Gas Council. Annual Report and Accounts, 1961–62. pp. 170. H.M.S.O. 11s. 6d. net.

The report, for the year ended March 31, 1962, shows an excellent result on the year's working. In the first place every Area Board had a surplus, the aggregate being £3,333,997. Secondly, the sale of gas increased by 2·7 per cent over the previous year. Sales in the domestic market alone were up by 4·2 per cent.

Of particular interest to the drive for clean air, because of the way in which they are assisting smoke control area progress, are the increases in the sale of domestic appliances, especially space heaters. Over the past four years the figures are:

1958–59	..	194,060
1959–60	..	244,524
1960–61	..	265,358
1961–62		326,423

The sales of warm air and central heating units was again at a satisfactory high level. During the year some 15,000 warm air units were installed and 22,500 central heating boilers, an increase in total of nearly 50 per cent on the previous year's figures.

Coke

The chapter of the report dealing with coke and manufactured fuels states that sales to the domestic market showed an increase of about 2½ per cent. It adds:

> " In response to suggestions made throughout the country from time to time that the development of smoke control areas was being held up through lack of the specially reactive types of fuel, steps were taken to make additional quantities available over wider areas, particularly in Greater London. Total sales of these fuels, while higher than last year, were nevertheless disappointing, and the increased production proved to be considerably in excess of the demand."

Another paragraph refers to the difficulty of maintaining a satisfactory service at times of peak demand in winter, and of steps taken to increase the availability of the named fuels in pre-packed paper bags, usually in 28 lb. sizes. " Pre-packaging of fuels is, of necessity, expensive, but experience has shown that demand exceeds supply during cold spells, and it is considered to be a valuable adjunct to the normal form of delivery, and a very useful safety valve.

The report continues by discussing a conference held in June, 1961, organized by the National Federation of Coke Distributors' Associations, to consider the suitability of " Gloco " as an open fire fuel and its acceptability by householders in smoke control areas. It goes on:

> " The unanimous conclusion of the conference was that " Gloco " (and " Sebrite ") met fully the requirements of the Beaver Committee, as detailed in paragraph 78 of their report, and that it was a suitable and acceptable fuel, provided it was used on an approved open fire with ⅝ in. firebar spacing.
>
> " The Gas Council welcomed the findings of this conference; while the gas industry is not the only producer of solid smokeless fuels for smoke control areas, it must, for some years to come, be the principal supplier."
>
> " With the continued development of smoke control areas, the independent Distributive Trade must play an increasingly im-

portant part in the distribution of solid smokeless fuels in replacement of house coal, and the Gas Council and the National Federation of Coke Distributors' Associations are taking all reasonable steps to see that householders in smoke control areas receive from their suppliers any advice and instruction which may be necessary to ensure that they obtain the best service possible from their new fuel and appliances."

There is much other information of interest from the clean air viewpoint to be found in the report, including the sections on the importation of liquefied natural gas, the storage of gas underground and research.

ELECTRICITY IN ENGLAND AND WALES

The Electricity Council, Annual Report and Accounts 1961-62.

Central Electricity Generating Board, Annual Report and Accounts 1961-62.

H.M.S.O., each 11s. 6d. net.

The Electricity service in England and Wales continues to expand and during the year under review 103,685 million units—an increase of 7·9 per cent.—were supplied to 16,101,398 consumers at an average price of 1·550d. per unit. Approximately one half went to industry, one third to domestic consumers and one eighth to shops and offices.

The total revenue amounted to £748·7 million, including income from contracting and sales of fittings. Expenditure on revenue account amounted to £721·8 million, including fuel £252·6 million, depreciation, interest and financial charges £206·5 million, salaries and wages £136·9 million, leaving a surplus of £26·9 million, a return of 11·3 per cent. gross on net assets.

The Central Electricity Generating Board supplied 116,906 million kWh. of which 1,404 million were purchased from industrial and other organizations from whom Area Boards also purchased a further 154 million kWh.

The total maximum output capacity at the end of the year amounted to 28,959 MW., 1·892 MW. higher than the previous year. The maximum demand 27,020 MW. occurred on Tuesday January 2, 1962, during the half hour ending at 5.30 p.m., 10·5 per cent. higher than the maximum demand in 1960-61.

The load factor on the system was 49·0 per cent. and the average thermal efficiency 27·32 per cent. The thermal efficiency of the Generating Board's steam stations varies from some 34 per cent. in the new large high-pressure stations to as low as 4 per cent. in some of the old small low-pressure stations which have to be kept in commission to meet peak demands. The load factor of some of these stations is less than one per cent.

Clean Air

The retention in service of many obsolete stations likely to be operated for a few hours only during the year has presented difficulties in the implementation of the Board's policy to make the maximum possible contribution to the Clean Air Campaign. The Board have decided however to modify or renew grit-arresting equipment in some of these stations so that discharge from chimneys is kept to a minimum. It is also the intention of the Board to provide a single tall chimney for new stations up to 2,000 MW.

The development of loads restricted to off-peak periods continues and by the end of the year 118,000 consumers were supplied, an increase of 35 per cent. The total off-peak space-heating load now amounts to 1,750 MW.

Load forecasts in recent years have proved to be under-estimates and the Industry has adopted revised forecasts for the six years to 1967-8.

During the next five years it is proposed to commission 11,092 MW. of conventional plant and 2,405 MW. of nuclear plant. Taking into account plant outstanding from earlier programmes and allowing for closing down of old plant and revision of ratings, the net output capacity will be approximately 43,000 MW. by the end of 1966.

Commissioning tests were carried out on the first two nuclear power stations at Berkeley in Gloucestershire and Bradwell in Essex.

The size of generators and the operating steam pressure show a steady increase. Two 200 MW. sets operating at a pressure of 2,350 pounds per square inch are to be commissioned at High Marnham (Retford) and before the end of 1966, 350, 500 and 550 MW. sets operating at pressures of from 2,350 to 3,900 pounds per square inch are to be in operation. Some gas turbine sets of 17·5 MW. are also to be installed.

It is estimated that in England and Wales there are 281,116 farms of which 244,277 or 86·9 per cent. were by the end of the year connected to electricity supply. A large proportion of those outstanding will be less economic to connect owing to their remoteness and average cost is already rising to £300 per connection. In consequence consumers are encouraged to make full use of supplies, and during the year average consumption per farm rose from 7,617 to 7,873 kWh.

During the year the cross-channel circuit with France came into operation and 33·2 million kWh were transferred from France to England and 28·8 million kWh. from England to France. During January 1962 a ship's anchor damaged the cable. 880 million kWh. were transferred from England to Scotland and 679 million kWh. from Scotland to England, some of which was generated by the North of Scotland Hydro-Electric Board.

The Generating Board's stations consumed 53·1 million tons of coal of which 30·7 million tons were transported by rail, 10·6 million tons by road and 7·2 million tons by sea. The Board has 29 colliers in commission. 73·8 per cent. of the coal was burnt in pulverized form.

To meet higher demands and to limit the number of high voltage transmission lines the Generating Board have made further progress in plans for using a transmission pressure of 400 kV., the first line of which will come into operation in 1965. The conversion of sections of the 275 kV. system will follow. The larger part of this system has been built with conversion in view. At the end of the year the Generating Board's main transmission system comprised 13,271 circuit miles, an increase of 706 circuit miles during the year.

In accordance with the White Paper on the Financial and Economic obligations of the Nationalized Industries, it has been determined that the Electricity Industry is expected to earn annually a gross profit of 12½ per cent. on its net assets during the five years from April 1, 1962, involving the earning of a surplus of £336 million, about one half being earned by the Generating Board. This will mean that in addition to improving the efficiency of their operation, it will be necessary for most Boards to increase their charges.

Improved Conversion Grants?

Mr. Richard Wood, M.P., Minister of Power, speaking at a luncheon of the National Federation of Coke Distributors' Associations recently, said that improving grants for conversions in smoke control areas, to enable more costly solid fuel appliances to be installed, would be considered. Sir John Charrington, in the chair, had appealed to the Government to extend grants to include closable stoves.

Further I.R.T.E. Report on Diesel Smoke

In the Summer, 1962, issue of this journal (No. 122, page 303) we published the text of a first report of the Vehicle Exhaust Study Group of the Institute of Road Transport Engineers. The Institute has now published a Second Interim Report of the Group, of which (with the exception of a list of acknowledgments) the following is the full text.

Introduction

In its First Interim Report, published in March 1962, the Study Group accepted that gross emissions of exhaust smoke from improperly maintained or badly operated vehicles amounted to a flagrant violation that could be handled within the framework of existing legislation. It also drew attention to the more widespread problem of marginal levels of exhaust smoke emission. This general problem was attributed by the Group to the narrow margin that is today found to exist between a satisfactory smoke free engine performance and the onset of visible exhaust smoke.

The purpose of this Second Interim Report is to present the Group's findings on two aspects considered as possible contributory causes of exhaust smoke emission, *viz.*

1. Fuel injection equipment, and
2. Fuel.

Fuel Injection Equipment

The Group acknowledges the painstaking precautions successfully taken by manufacturers to produce to the standards demanded by modern "near-the-acceptable-smoke-limit" engines, but criticism is directed at the service exchange schemes that purport to offer replacement units to factory standards. Manufacturers' depots are said to recondition to factory limits but the proportion of Company-operated depots is small compared with the number of appointed agents and "free-lance" repairers.

Many examples of the inadequacies of the units reconditioned by these organizations (viewed as a body) have been provided by Study Group members and other I.R.T.E. members. Large fleet owners find it necessary to install special testing equipment and to employ skilled staff to check service exchange units. Operators of smaller fleets and of widely dispersed fleets, who are not equipped in this manner, are obliged to rely on the standards set by the repairers.

Economic pressure to produce service exchange units at relatively low fixed prices is thought by the Study Group to be a factor that accounts for reconditioned units being of a quality below the standard of the original equipment.

Another factor considered to be of influence is the absence of standard specifications for testing reconditioned units. An injection pump set to the nominally correct figure on one testing machine can be found to give a significantly different result on another machine. For testing injectors there is a variety of different machines and techniques in use. The efforts of fuel injection equipment manufacturers and the manufacturers of testing equipment to overcome these difficulties is not overlooked by the Group but it feels that the absence of standard testing specifications is to be regretted.

Fuel

In the past, vehicle operators (especially of P.S. vehicles) have preferred to buy fuel of a high specific gravity to obtain the maximum possible power and maximum mileage from each gallon of fuel. The high gravity requirement appears to have been met without impairing the other principal characteristics of DERV fuel, *i.e.* ignition quality, low temperature performance and sulphur level, although these requirements conflict from a production point of view.

However, it is known that specific gravity is the fuel factor that probably influences the emission of exhaust smoke most of all. This is partly because it gives a rough indication of the distillation range—a high gravity corresponding to a high proportion of less volatile components, which are less easily burnt in the engine and lead to more smoke, if only to a marginal extent.

To effect by means of fuel quality changes a reduction in exhaust smoke density, or to increase the margin between a satisfactory smoke free performance and the onset of visible exhaust smoke, a light product would be required. The Study Group is given to understand that a fuel of lower specific gravity could be made available without sacrificing the low temperature performance or sulphur level. Furthermore, a lighter, more volatile fuel would have slightly enhanced ignition (cold-starting) properties.

Its actual, quantitative influences on exhaust smoke would depend upon individual characteristics and response, but in all cases it would be very small indeed. A figure of 2½ per cent. to 3 per cent. has been suggested as the maximum extent to which the smoke-limited power curve could be raised by a change in fuel quality. This improvement must be compared with the 30 per cent. to 50 per cent. reduction in the smoke-limited power curve that can result from a set of incorrectly serviced injection equipment or even just one mal-functioning injector.

The Group accepts evidence obtained from certain authoritative sources that fuel additives have been found to be ineffective in reducing exhaust smoke emission.

Conclusions

1. In view of the " near-the-acceptable-smoke-limit " nature of many modern engines, the absence of standard specifications for testing reconditioned fuel injection equipment may account for difficulties encountered by fleet operators in keeping vehicles smoke free.
2. It may not always be economically possible for all units to be reconditioned to the " as new " standard.
3. No professional body or trade association exists in the United Kingdom to control the standard of testing, workmanship or code of practice of the equipment repairers.
4. In meeting operators' requirements for maximum power and fuel economy from DERV fuel, the specific gravity has been held to a maximum. This is a practice that is perhaps not in the best interest of ensuring a perfectly clean exhaust. (There is no gravity clause in British Standard 2869: 1957 Class A.)
5. Apparently the specific gravity of DERV fuel could be lowered without sacrificing the other principal characteristics, but operators might then have to tolerate a small increase in fuel consumption or a drop in output, in return for a very marginal reduction in exhaust smoke density, compared with the increase that results from mechanical shortcomings.
6. On the basis of present knowledge of fuel additives, it is thought that a solution to the exhaust smoke problem is unlikely to emanate from their use.

Recommendations

Bearing in mind the Study Group's recommendation in its First Interim Report to the effect that a national, fully representative and authoritative body be formed to consider the overall problem of exhaust smoke emission, the following recommendations are made:

1. Standard specifications for testing reconditioned fuel injection equipment should be established.
2. Standards of workmanship and a code of practice for fuel injection equipment repairers should be set up by a suitable organization.
3. Operators should be advised against the use of high specific gravity fuels and consideration should be given to the inclusion of a specific gravity clause in a DERV fuel specification.

AIR POLLUTION—NEEDS FOR RESEARCH AND CONTROL

*by V. G. MacKenzie**

Excerpts from paper presented at the Conference on Air and Water Pollution, Elizabeth, New Jersey, February 20, 1962.

General Background

AIR pollution is a serious health hazard. Sufficient evidence has now accumulated from research to make it clear that respiratory diseases of many kinds, both infectious and chronic, are related to, made worse, or actually caused by air pollution. There is much yet to be learned about the relationship between air pollution and respiratory diseases, but there is now no doubt as to the existence of the relationship. The problem is large. For example, one chronic respiratory disease, emphysema, is estimated to affect over one million Americans so severely as to seriously disable them. Reports of the Bureau of Old Age and Survivors Insurance indicate that 12 per cent. of its payments for disability are made to such individuals. Deaths due to this condition have increased nearly five-fold nationally in the last ten years. Increased numbers of respiratory deaths, particularly in cities, have contributed in major measure to the recent rise in the Nation's infant mortality rate. Respiratory diseases are the largest cause of work-losses due to industrial absenteeism.

National Objective in Air Pollution Control

The ultimate national objective in air pollution control is to protect the quality of the air resource used in common by the American people to the end that: (1) death and sickness caused by polluted air will be prevented; and (2) property damage and economic loss from air pollution will be minimized.

Action Needed

In order to accomplish the national air pollution control objectives, activities of two broad classes must be developed:

1. More scientific information must be developed, through research, to delineate further the problems, assess its effects in detail, and develop control methodologies where these are lacking.
2. Existing and future knowledge must be applied in the actual prevention of pollutant emissions much more broadly than has been done up to now.

Broad guidelines have been developed and are now in process of implementation for the research programme under item 1. Less progress is being made in the application of existing knowledge to the actual control of air pollutants. In the air pollution field, as in others relating to health, we should not and we cannot afford to wait until all the scientific answers are known in detail before we take preventive action.

Research Needs

Since World War II, the interest in research on air pollution problems has increased greatly. This increase in interest has been stimulated by a number of factors: the Donora incident in 1948; the First National Conference on Air Pollution in 1950; the emergence of the California smog problem and the gradual recognition of similar problems elsewhere; the initiation of the Public Health Service air pollution programme in 1956 with its emphasis on research, and the National Conference on Air Pollution in 1958.

In the past two years, several groups

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* Chief, Division of Air Pollution, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington 25, D.C.

of eminently qualified persons, representative of the public and private sectors of our society, and including experts in the physical and biological sciences and engineering, have reviewed in some detail the needs for research in the air pollution field and made recommendations thereon.

The first of these groups, the Ad Hoc Task Group on Air Pollution Research Goals, appointed by the Surgeon General, made its report in August 1960. In considering the total research effort needed, the Task Group identified *ten principal goals* for detailed consideration: (1) Effects on Man, (2) Agricultural Effects, (3) Economic Losses Due to Damage to Materials, Soiling, and Reduced Visibility, (4) Measurement and Identification, (5) Meteorology, (6) Atmospheric Reactions, (7) Surveys and Monitoring, (8) Control, (9) Information, Education, and Training, and (10) Administrative and Legal Aspects.

The recommendations call for about a three-fold progressive increase in the nationwide air pollution research effort from the 1960 estimated level of about \$11 million annually to approximately \$32 million per year by 1968. Of this maximum annual expenditure, about 40 per cent. is considered the responsibility of the Federal Government, 28 per cent. the responsibility of industry, and 32 per cent. the responsibility of States and local governments. In the allocation of these responsibilities, the Task Group used the following general criteria: (*a*) the Federal Government should be largely responsible for research of a broad nature and of general applicability such as determining criteria for air quality; for the collection, integration, and communication of information, and for the training of specialized personnel; (*b*) industry's responsibility for air pollution research, although it extends in varying degree to each of the goals, relates primarily to the development of adequate and economical control equipment and procedures, and to other studies specific to individual industry emissions; and (*c*) States and local governments have responsibility to support research of primary interest to them and to survey and evaluate the air pollution problems of their respective jurisdictions.

Two other expert groups have also recently reviewed the need for air pollution research nationally. The Committee on Environmental Health Problems, appointed by the Surgeon-General, and headed by Dr. Paul Gross of Duke University, has considered research and other needs of air pollution and other factors of the environment in relation to health. Also, a special committee of the National Academy of Sciences on Atmospheric Sciences Research, under the chairmanship of Dr. Sverre Petterssen of the University of Chicago, has included in its report special sections on the physical sciences and engineering aspects of air pollution research. The reports of the Gross and Petterssen Committees are now being printed for widespread distribution.

All of these reports are in basic agreement as to need for a severalfold increase in air pollution research over the next several years. Their recommendations differ some in detail regarding the total magnitude of the needed research effort and with respect to the emphasis suggested for some specific areas of study. In general, however, the conclusions of all of them are in agreement and constitute a series of excellent guides for future research effort in this field.

Action in Concert

Air pollution control practices currently are largely pragmatic in character, with regulatory requirements necessarily based on judgments as to what control measures are practicable technically and economically. The development of more rational criteria and standards is desirable and will inevitably occur as we improve our knowledge through research and improved understanding of local and regional problems. To accomplish this, action in concert by Federal, State and local levels of government is necessary.

AIR POLLUTION ABSTRACTS

ABSTRACTS OF PAPERS PRESENTED AT N.S.C.A. ANNUAL CONFERENCE, HARROGATE, 1962

626. Presidential Address. Cohen, Lord (Proc. N.S.C.A. Conf., Harrogate, 1962.) Figures are given to illustrate the high incidence of bronchitis in this country and the growing death rates from respiratory diseases. The connection between chronic bronchitis, " the English disease " and air pollution is further supported by studies from abroad, where it is shown too that atmospheric pollution plays a substantial part in the ætiology of lung cancer. Our aim must be the maximum elimination of pollution not only from the point of view of health, but also for the sake of national productivity, on which air pollution has serious effects through economic costs and the tying up of manpower and materials. The belief that coke in domestic fires gives off injurious fumes is quite fallacious and in fact the total emissions of sulphur dioxide from equal weights of coal and coke when burnt on a fire, are the same. Smoke abatement would be speeded up if grants were given to people who voluntarily convert to smokeless combustion prior to an official approval.

627. Some Aspects of Air Pollution Control in the Steel Industry. Wood, A. H. (Proc. N.S.C.A. Pre-Conf. Tech. Session, Harrogate, 1962.) Ore preparation and iron-making are first reviewed. In discussing steelmaking itself, it is emphasized that the use of oxygen has made an impact on the industry and has given rise to problems of fume emission. The new processes and measures for controlling the pollution are described, with special references to the economics involved.

628. Mitigation of Air Pollution at Coking Plants. Cooper, R. L., and Graham, J. P. (Proc. N.S.C.A. Pre-Conf. Tech. Session, Harrogate, 1962.) The authors state that since 1956, the number of coking plants has dropped from 83 to 54. The closing of older plants has contributed to the reduction of air pollution from this source and there has also been a rise in the general level of efficiency and improvement of plant conditions in the large modernized works which now make up the industry. Extensive investigations and research into the prevention of pollution are described, especially during the re-charging of coke ovens, but also in relation to the emission of grit during the quenching of coke.

629. Air Pollution from Ironfoundry Cupolas. Shaw, F. M. (Proc. N.S.C.A. Pre-Conf. Tech. Session, Harrogate, 1962.) The author describes the changing character of the ironfounding industry, with the trend towards concentration of output in a smaller number of units. He reviews the apparatus available for arresting the solid emissions from cold-blast cupolas and concludes that grit and dust emissions from such cupolas can be adequately dealt with by wet arresters.

630. The 1958 Alkali Order Processes. Carter, J. S. (Proc. N.S.C.A. Conf. Harrogate, 1962.) The author deals with the problems in the industrial processes which are placed under the control of the Alkali Inspectorate. Difficulties in the iron and steel industry, copper and aluminium production, power stations, gas manufacture, the ceramic processes and limeworks, are described. It is concluded that in spite of certain technical problems still to be overcome, there are good hopes that the next few years will see the solution of most of our industrial pollution problems due to smoke, grit and dust.

631. Incineration and Waste Disposal. Cayton, S. (Proc. N.S.C.A. Conf. Harrogate, 1962.) The paper directs attention to the problems associated with waste disposal, with particular reference to the open burning of waste, and to the growing use of incinerators as an alternative. The author discusses the choice between incineration and controlled tipping and concludes that unless large and efficient incinerators with electrostatic precipitators to remove grit could be used, incineration should be replaced by other methods of disposal. Questions arising from this are considered in detail and a survey of experience and papers in the U.S.A. is given.

632. An Investigation into the Air Pollution at Geleen (Netherlands). Brasser,

L. J. and Joosting, P. L. (Proc. N.S.C.A. Conf. Harrogate, 1962.) Report of a scientifically controlled investigation on health effects of air pollution in the industrial area of Geleen in south-eastern Holland. Methods of measurement are described and discussed in conjunction with observations by general practitioners during a given period. A first analysis of the medical data suggests that the differences in the state of health of the population per quarter, are probably too slight to justify a definite conclusion regarding the effect of air pollution.

633. Progress in France. Levantal, G. (Proc. N.S.C.A. Conf. Harrogate, 1962.) The paper outlines the activities undertaken since 1959 by the " Association pour la Prevention de la Pollution Atmospherique " and the part it played in co-operating with the French authorities to control air pollution problems. The author describes the considerable progress made in France in the fields of investigations, research and organization.

634. Republic of Ireland—Air Pollution Control. Dawson, F. E. (Proc. N.S.C.A. Conf. Harrogate, 1962.) Due to a greatly increased rate of industrialization in the Republic of Eire, it was felt in 1956 that the pollution product in the State should be assessed and new air pollution control legislation made which would be adequate for the modern conditions. It appeared most realistic to plan legislation which would be flexible in character, both as regards the application and the times at which these controls might be brought into operation. As a result, the Local Government (Sanitary Services) Act, 1962, contains the statute law for Ireland on the control of pollution of the atmosphere, and the powers given to the Minister to make regulations are wide.

635. Progress in Western Germany. V.D.I. Commission. (Proc. N.S.C.A. Conf. Harrogate, 1962.) The paper covers the directives of the Clean Air Commission of the Verein Deutscher Ingenieure (German Engineers' Association). The report deals in detail with the proposed limitation of dust emissions from cupola furnaces.

636. The Problem of Smoke in the German Iron and Steel Industry. Guthmann, K. (Proc. N.S.C.A. Conf. Harrogate, 1962.) New processes in iron and steel manufacture, especially the application of oxygen in steel production, have given rise to serious problems of atmospheric pollution within these industries. The paper describes the progress at German steel plants, with particular reference to the arrestment of iron-oxide fumes.

GENERAL ABSTRACTS

637. Chemistry of Town Air. Commins, B. T. (" Research ", October 1962, 421-426.) Several aspects of the chemistry of air pollution are discussed. These include the combustion of fuels, properties of air contaminants and the chemical reactions which take place in air. The concentrations of some air pollutants during high pollution in London are given.

638. Estimating Recent Carbon Monoxide Exposures. Ringold, A. *et al.* (Arch. Env. Health, October 1962, **5**, No. 4, 308-318.) The paper presents the experience of using expired air as an indicator of the per cent. of haemoglobin bound as carboxyhaemoglobin. The precision of the method is estimated, and by measurement of carboxyhaemoglobin, the validity is assessed. Experience with the use of this method in population samples is presented.

639. Current Air Pollution Field Research in Chronic Respiratory Disease in the United States. Landau, E., and Roberts, A. (Public Health, November 1962, **78**, No. 1, 11-20.) The growing interest in the demonstrated health effects of air pollution has prompted a considerable expansion of field research in chronic respiratory diseases in the United States. Several studies in different parts of the country are described, in which investigations were made of the association between such diseases and atmospheric conditions. The re-survey of the city of Donora, Pennsylvania, by the University of Pittsburgh 10 years after the 1948 smog disaster, showed that persons reported ill at the time of the episode continued to have higher rates of illness than other persons living in the city at that time. Persons who complained of more serious illnesses in 1948 demonstrated greater subsequent mortality and morbidity.

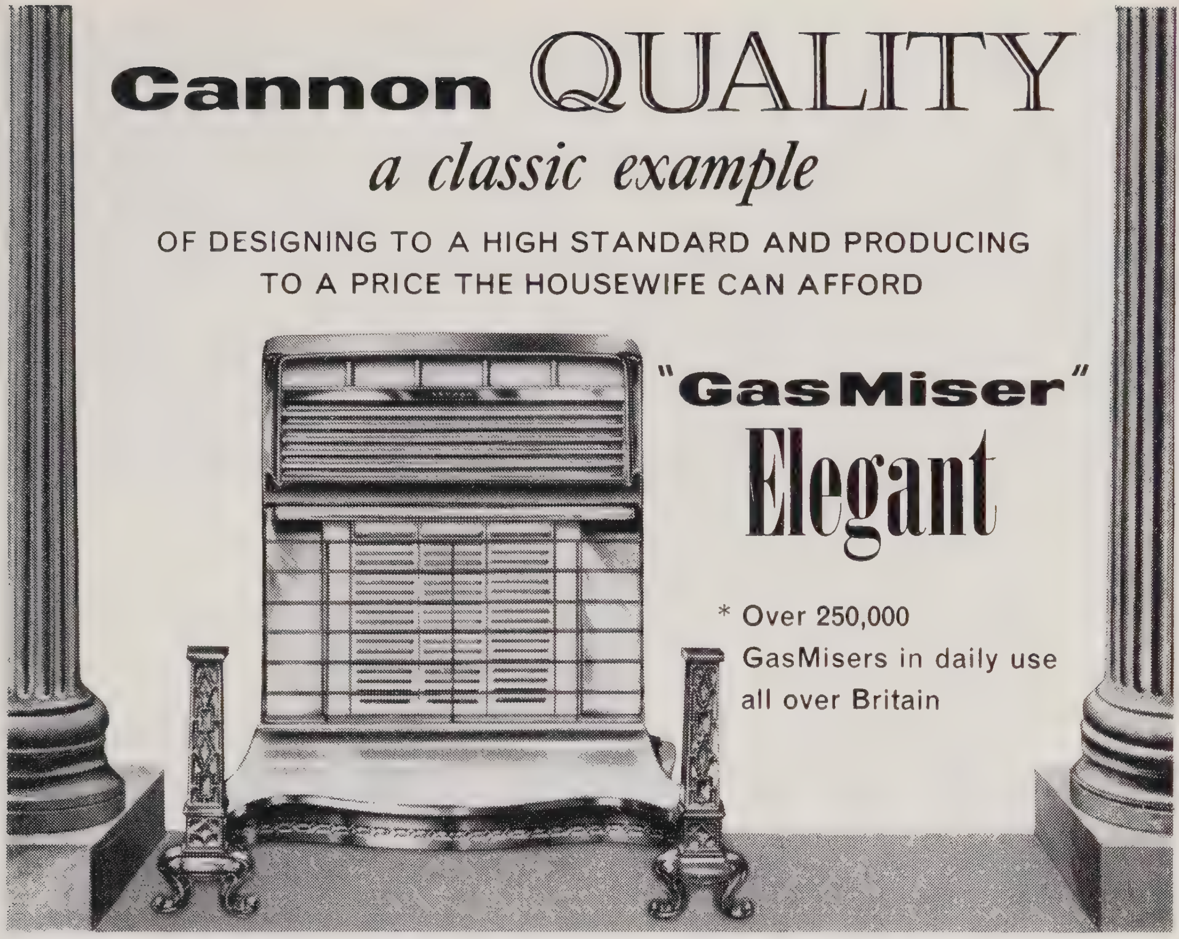
640. Air Contamination: a Respiratory Hazard. Farber, S. M. and Wilson, R. H. L. (J. Amer. Med. Assoc., May 1962, **180**, 362-6.) Although a connection between air pollution and non-malignant respiratory diseases can only be proposed tentatively, the connection between air pollution and cancer of the respiratory system is as sure as statistical studies can make it. Studies from all parts of the world converge upon one conclusion, that air pollution plays a substantial role in the ætiology of bronchogenic carcinoma. The urban-rural comparisons are particularly convincing, especially when they have been adjusted for smoking habits. Every rural-urban incidence study for lung cancer would appear to support the view of greater incidence in urban over rural although the degree may vary markedly. A problem of definition plagues all such massive studies. Cited is the instance of a farmer living 100 ft. or so off a super-highway actually living in a more " urban " environment than many city dwellers. Also there is the essentially rural resident who drives annually many miles in urban traffic. Each cancer of the lung may be the product of many airborne ætiological agents working additively. We do not know, exhaustively, what these agents are. Air pollution plays an important role in the ætiology of not only lung cancer but also many other chronic respiratory diseases. (A.P.C.A.)

641. A method for evaluating SO_2 tolerance levels for forests and agricultural crops from field tests at Biersdorf. Guderian, R. (Staub, 1960, **20,** No. 9, 334-337.) Plants in wooden tubs were placed near an iron-ore-roasting works in order to obtain tolerance levels for air pollution by SO_2 with respect to plants. The concentrations of SO_2 varied between 0-7 p.p.m. Macroscopic examinations were made to determine the effect of concentration and length of exposure. The rate of shoot growth, crop height and size of leaves were measured, together with ash content and the germinating growth of the plants. (C.E.G.B.)

642. Power Stations and Pollution. Davies, D. (Brit. J. Dis. Chest, 1962, **56,** 171-175.) Modern power stations burn large quantities of coal. Though great attention is paid to the reduction in the discharge of smoke and grit, the policy now is to allow all the sulphur dioxide produced to enter the atmosphere. At present the Central Electricity Generating Board does not consider that this is a hazard to health and is prepared to site enormous power stations close to large cities. The evidence relating morbidity and mortality to small increases in pollution is considered. There is a positive connection and all the evidence indicates that sulphur dioxide is no less important than smoke. A modern power station is the best place for burning coal but on present knowledge it should be sited away from large centres of population because of the sulphur dioxide produced. The failure of the Clean Air Act to deal with sulphur dioxide emission is discussed briefly.

643. Sulphur in Oil Fuels: Its Effects in Combustion. Kirov, N. Y. (J. Inst. Fuel, October, 1962, **35,** 426-431.) The presence of sulphur in oil fuels may lead to: (i) formation of deposits on high-temperature surfaces; (ii) corrosion and blockage of air-heaters, economizers and other surfaces at relatively low temperatures; and (iii) emissions of acid-laden smuts and corrosive condensates which pollute the atmosphere. These problems are discussed in relation to: (i) the oil fuels marketed in Australia; (ii) the formation and nature of the acid condensates; (iii) their effects on plant efficiency and availability; and (iv) air pollution control. Finally, various techniques and remedial measures are discussed which have been developed to study and control these problems in plants burning residual oil fuels. A classified bibliography of recently published papers is included.

644. The Absorption of Water by Coke. Burden, F. A. and Grey, J. R. (Inst. Gas Engs., London, November 1962, London meeting.) In recent months, increasing attention has been focussed upon the moisture content of solid fuels, and particularly of coke, which, by virtue of its method of production, contains a certain proportion of water, which may be increased by subsequent storage in heaps in the open. The extent to which water is absorbed by coke has received little attention in scientific literature, and the magnitude of the practical problem is therefore difficult to assess. This paper brings together existing information and also the results of new investigations into the absorption of water by coke when totally immersed and then exposed to the weather. The effect of exposure in rail wagons and storage heaps is discussed. Present evidence is that the absorption of water by coke is less than is generally believed. Further lines of investigation are suggested, together with possible methods to assist in the recovery from storage of coke having a satisfactory moisture content.



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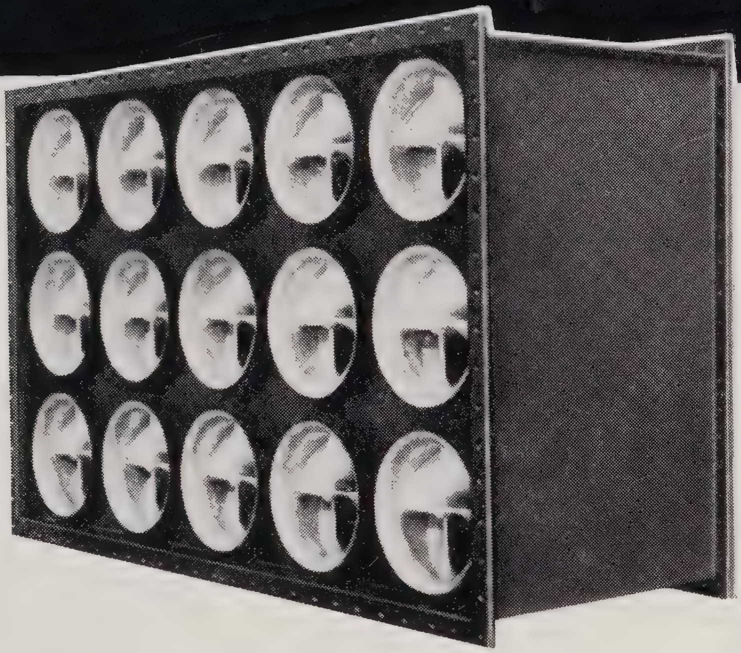

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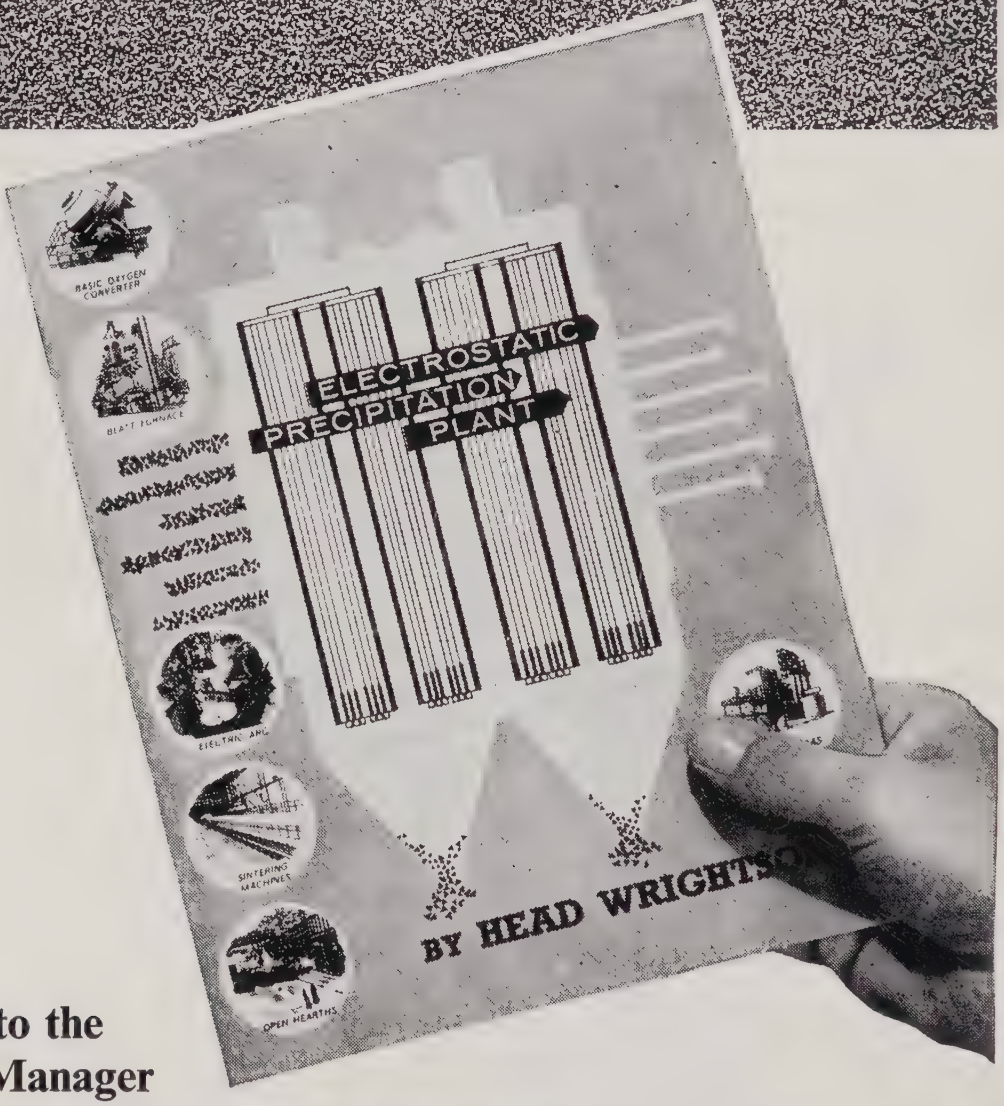

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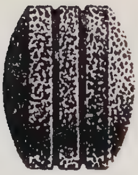

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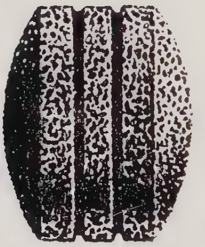

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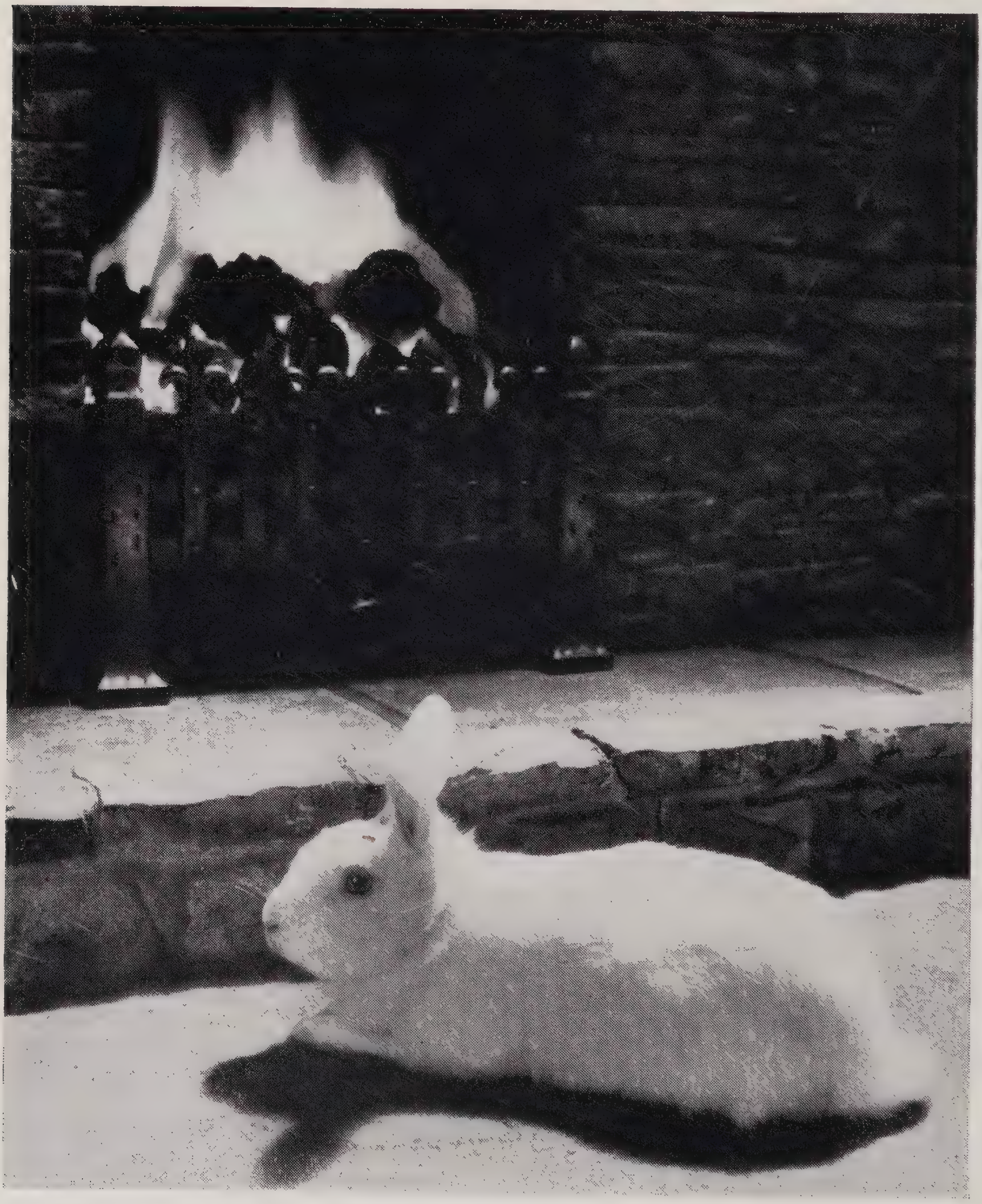

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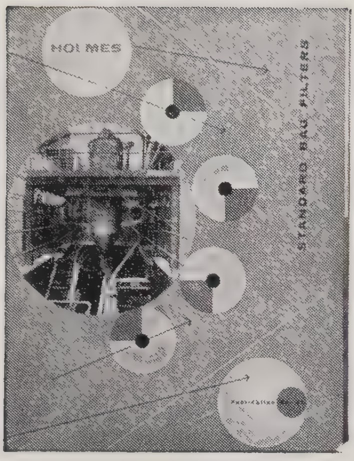

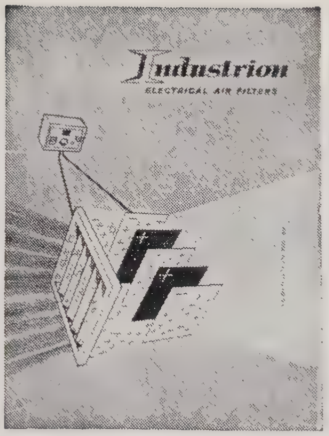

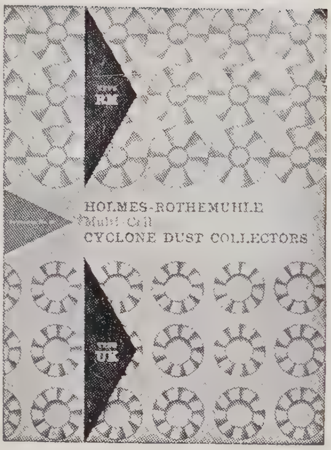

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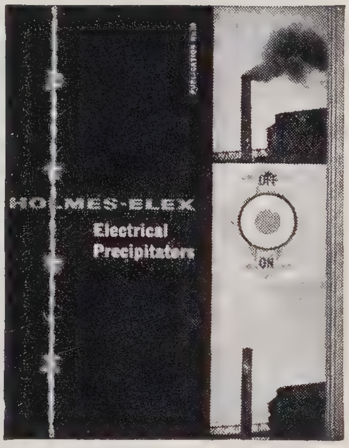

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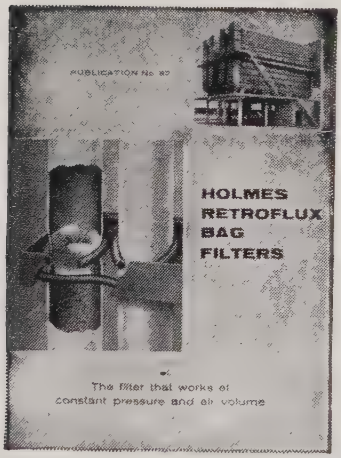

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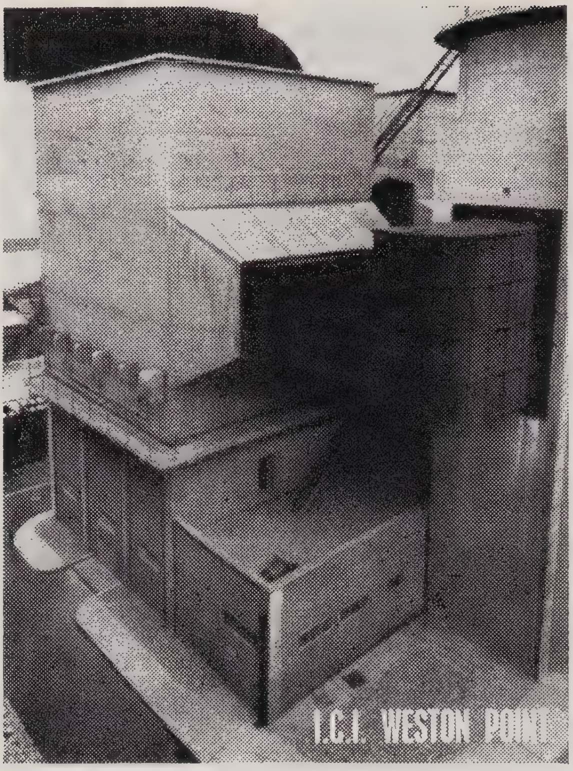

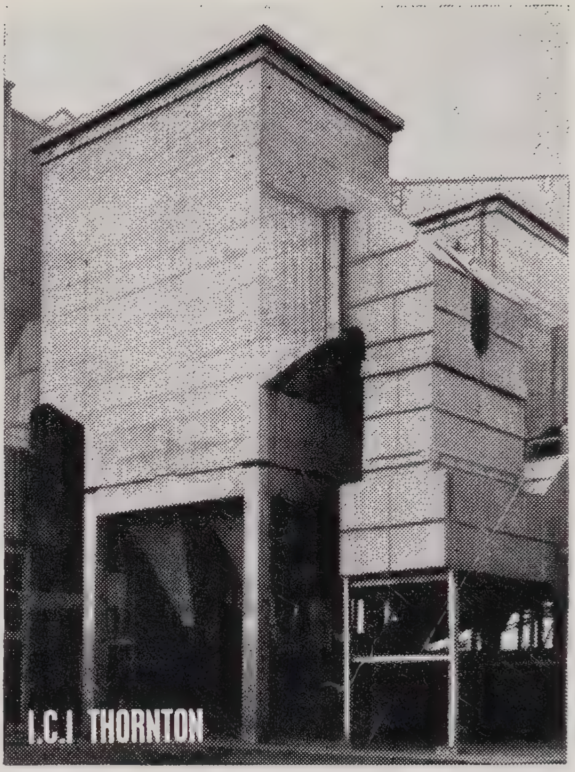

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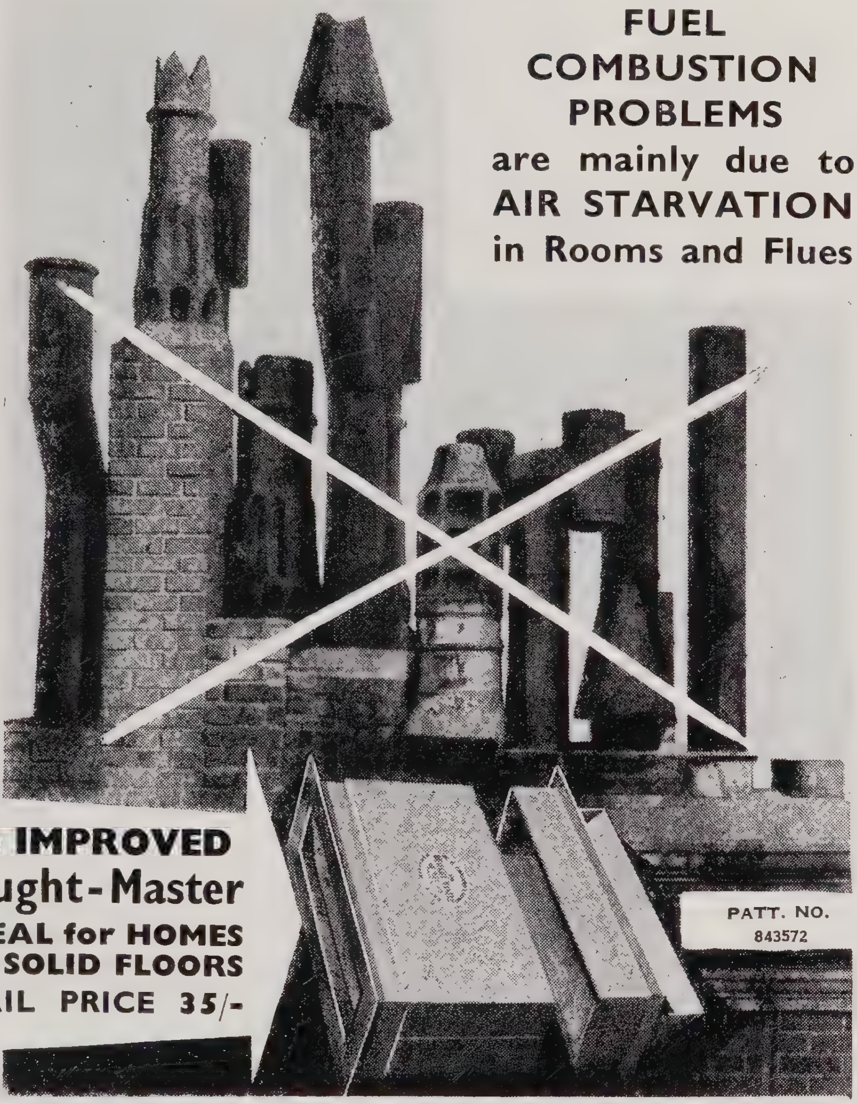

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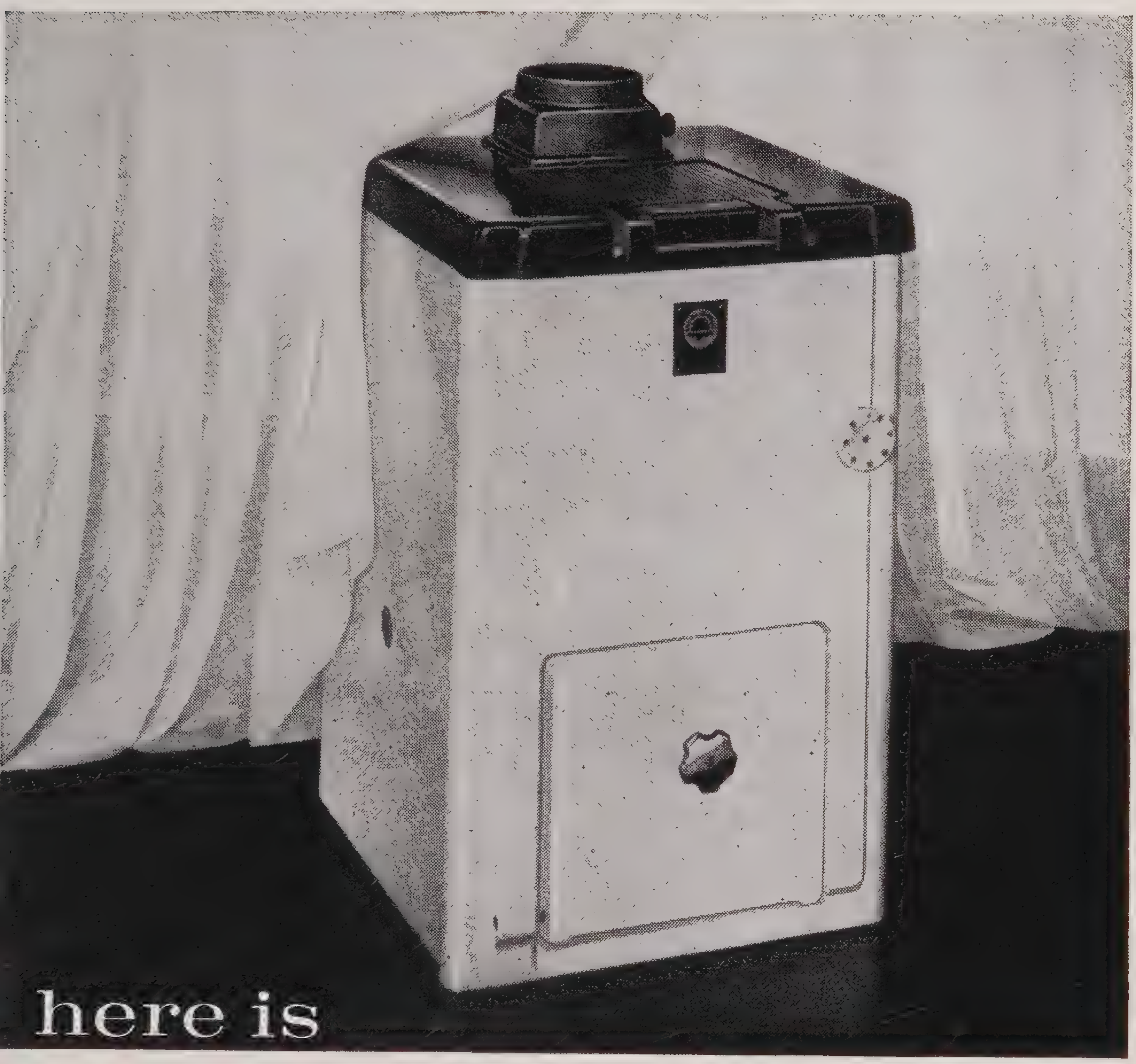

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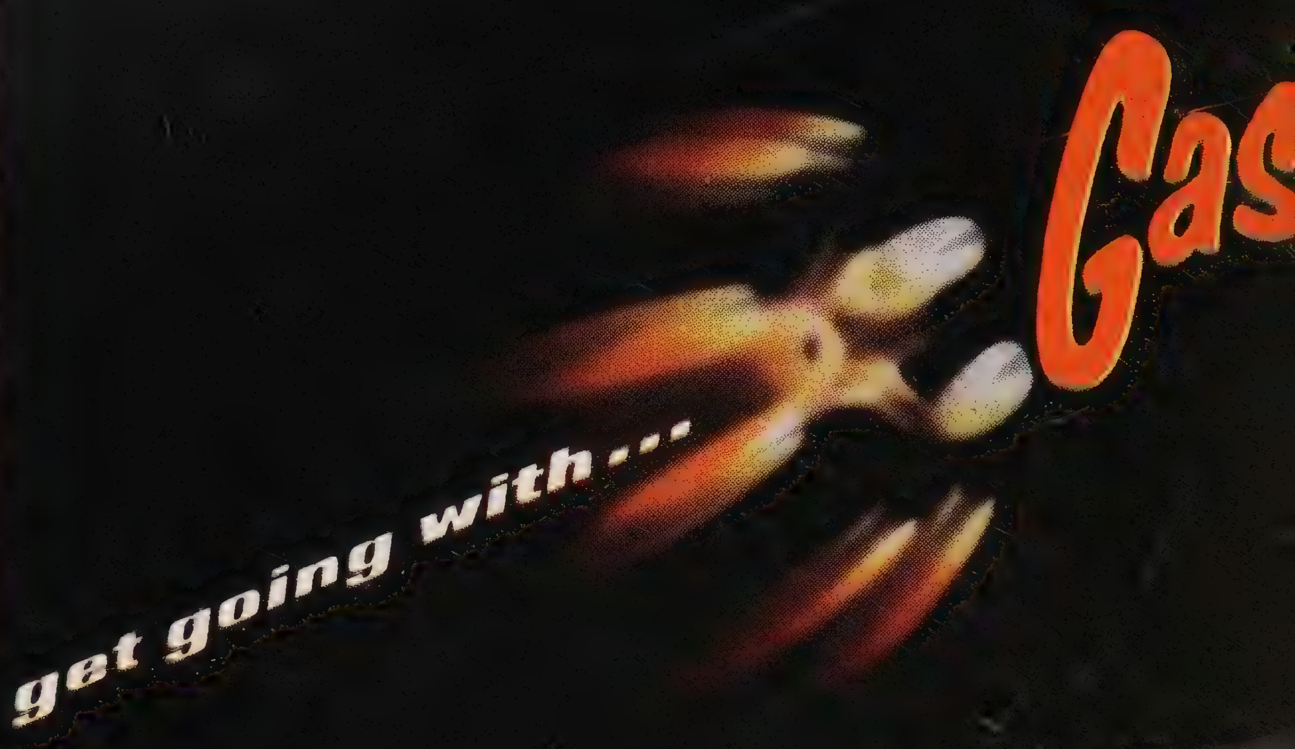

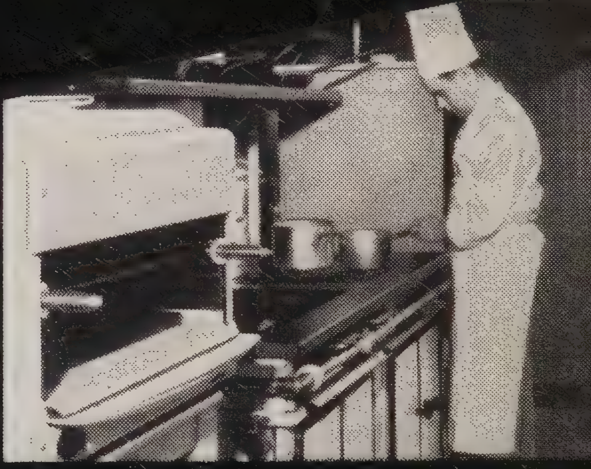

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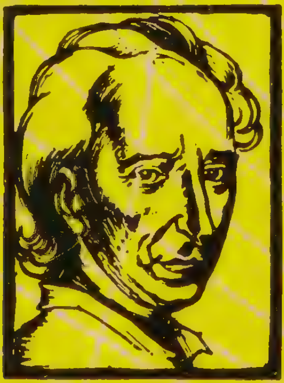

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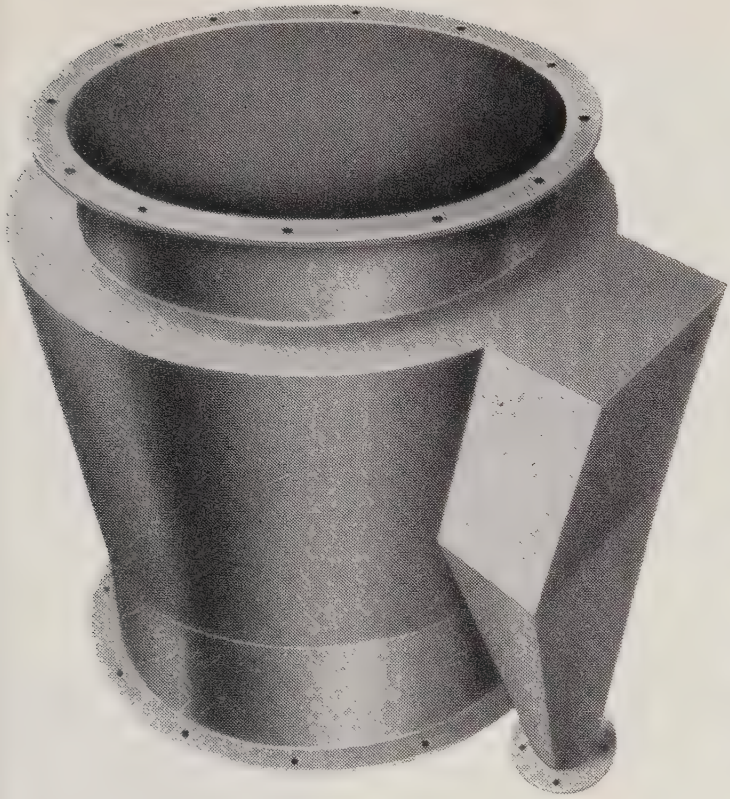

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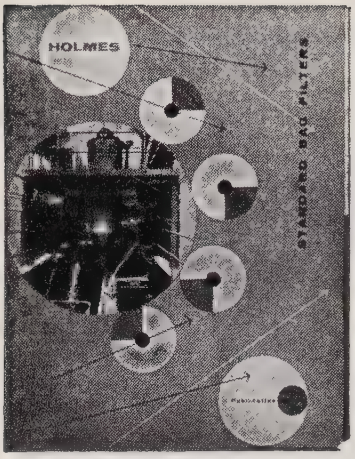

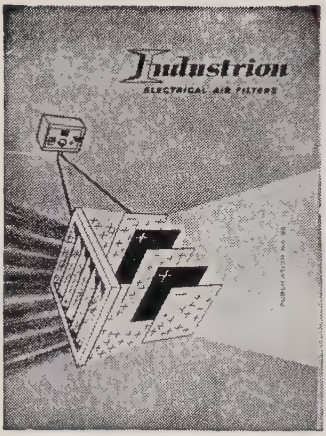

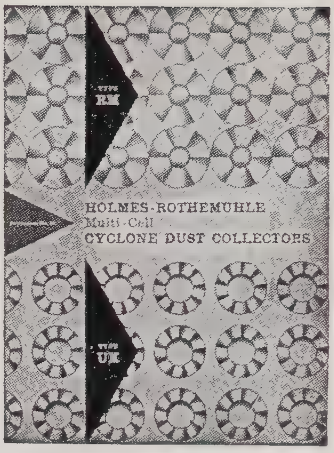

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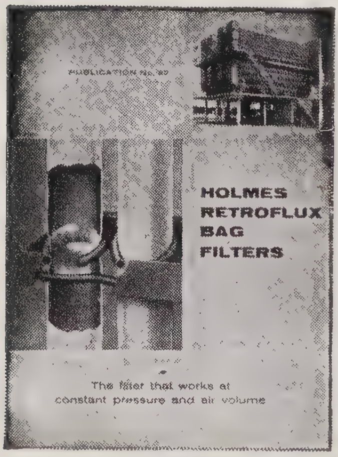

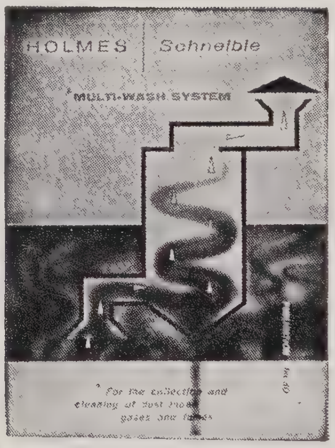
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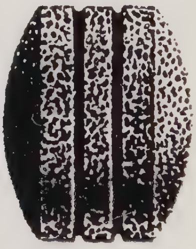

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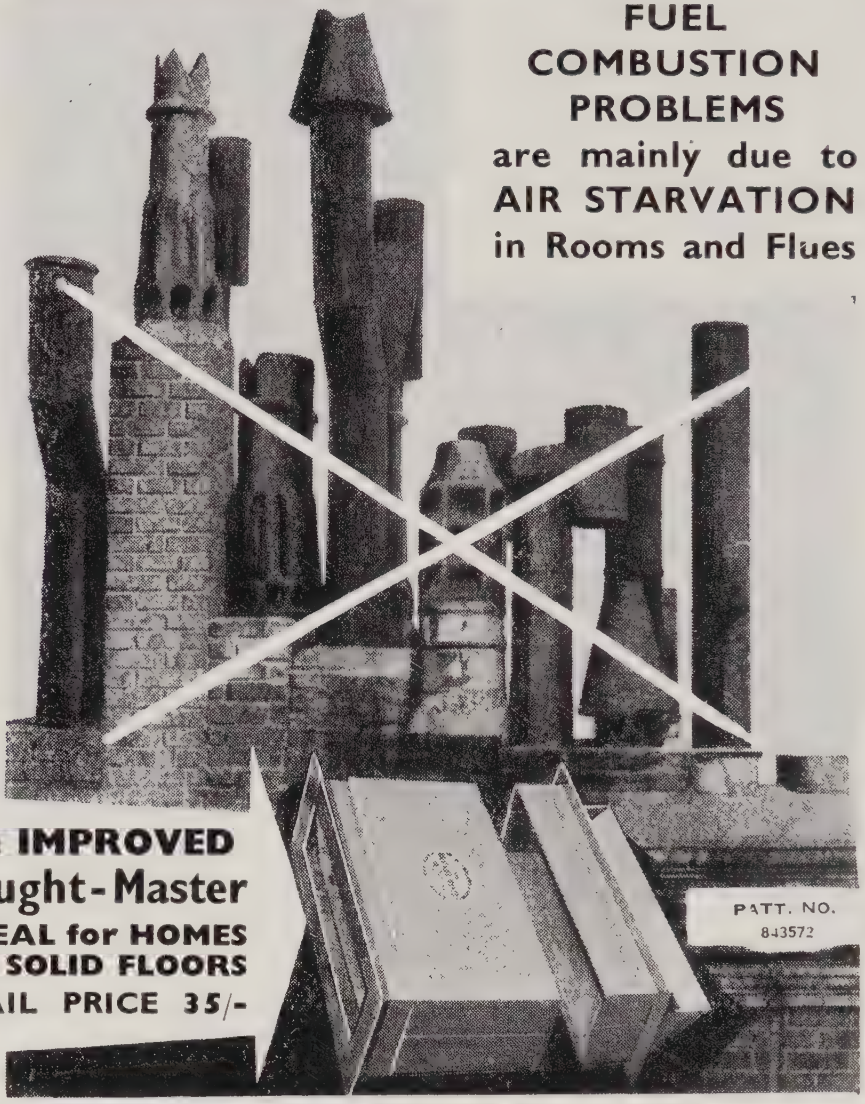

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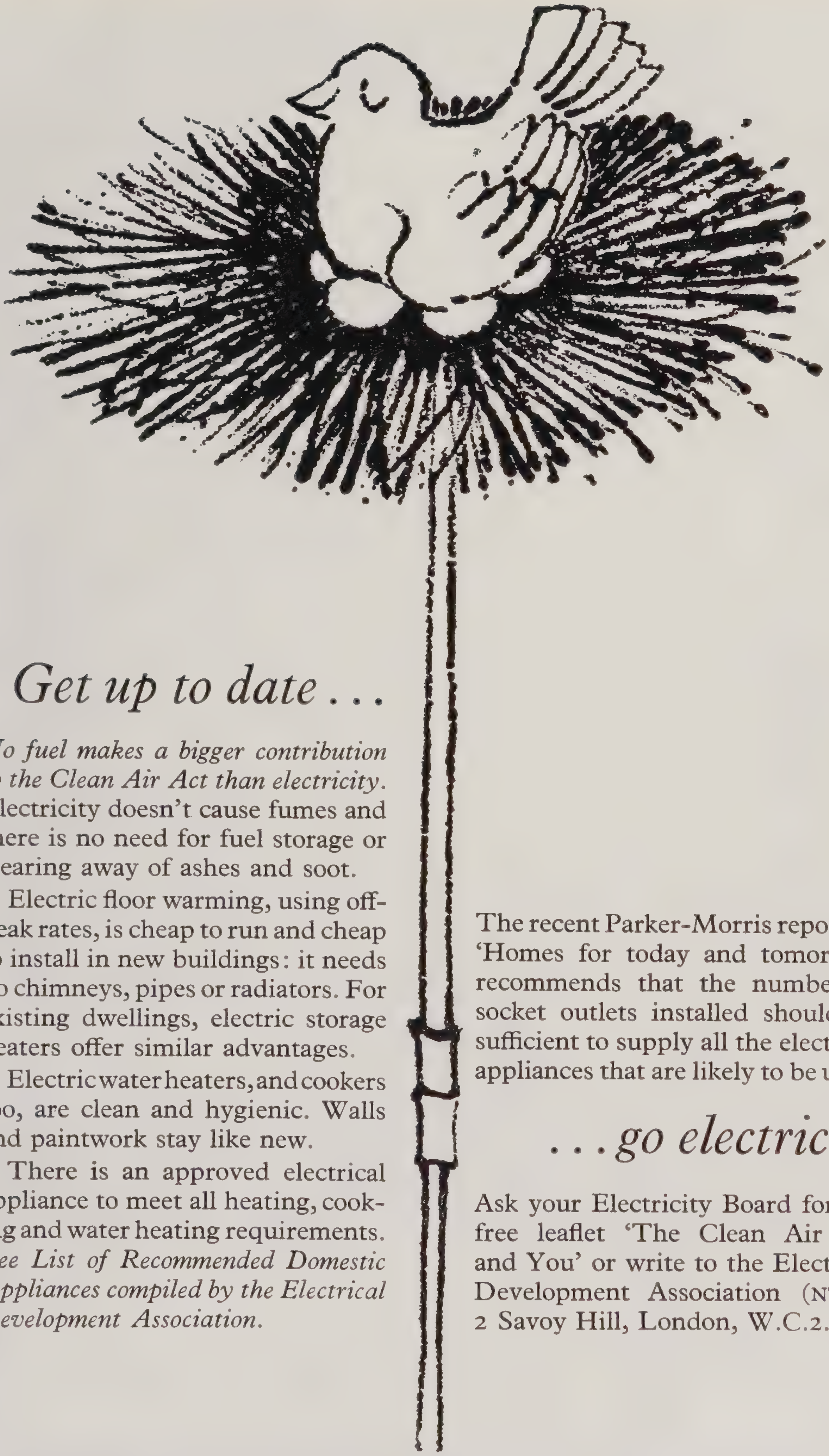

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Assembly Hall, Royal Commonwealth Society, Craven Street, W.C.2

Wednesday, April 17, 1963

at 2.30 p.m.

The meeting follows the Annual General Meeting (members only) at 11.30 a.m., and a Society Luncheon at 12.30 for 1 p.m. Tickets for the Luncheon are available at 25s. each, but as the number has to be limited early application is advised. (See also page 182.)

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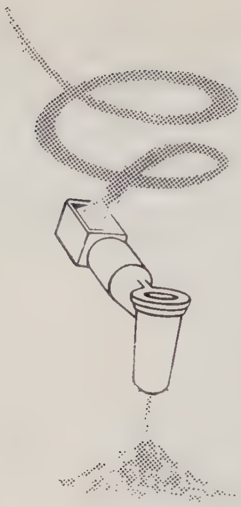

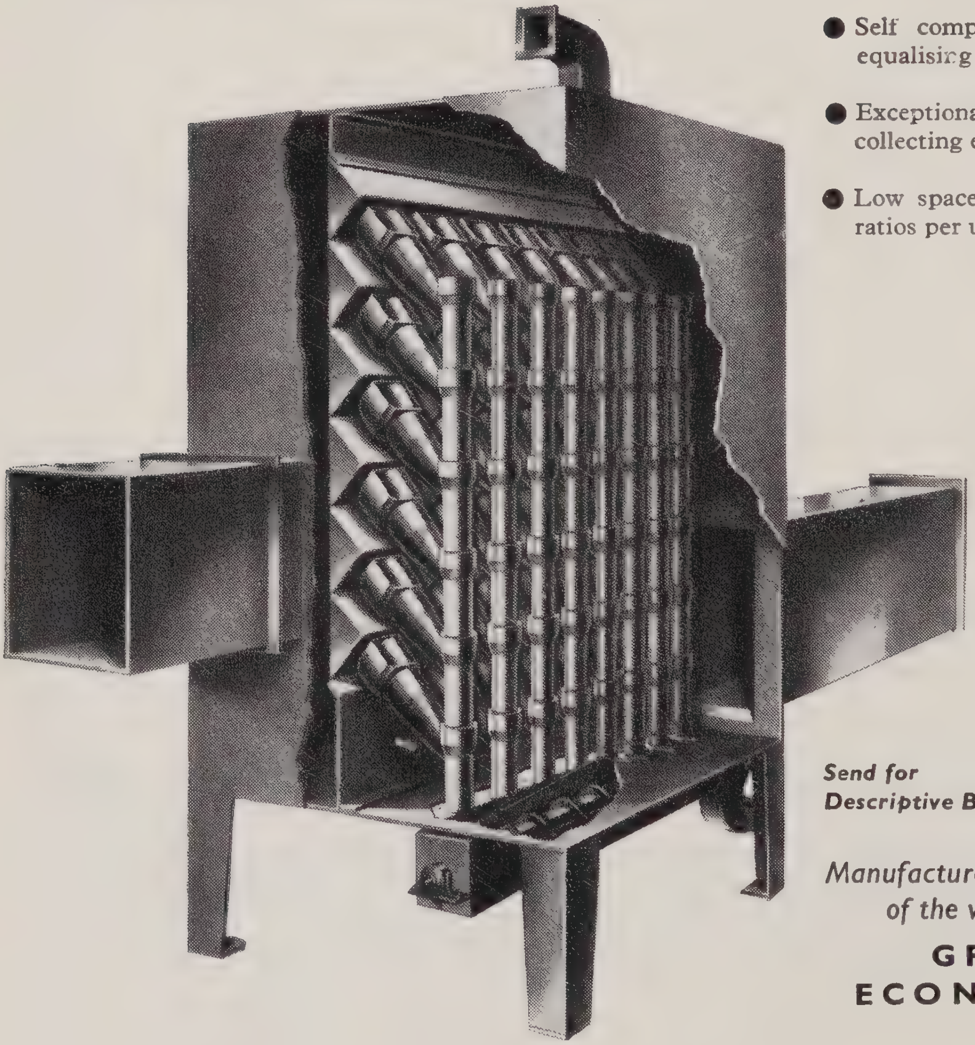

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Vol. XXXIII No. 125 Spring 1963

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Ships, towers, domes, theatres and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

THE FOG AND THE FROST

THE Society has had a strenuous and difficult winter as a result of the fogs in December and the cold in January. Both events gave rise to attacks on clean air policies. Even though these were due to muddled thinking and were for the most part on the fringe, they had to be met and contained. They have done no harm to the better-informed, but they did reveal how many are ill-informed and prejudiced. It is salutary to be reminded of this resistance that every reform encounters as it moves towards success.

One of the shortcomings of a quarterly journal is that events of importance seem always to occur at the wrong time, and our last issue was actually printing during the time of the smog. It was possible only to insert a slip saying that a statement had been prepared on the notorious "Tonight" TV programme in which the Clean Air Act had been declared to be eyewash and a swindle. This, as it happened, had to be extended and became a supplement to the journal. Copies were sent to readers on request and were issued to the Press. For the many who have not seen it, and also for the record, the supplement is printed, just as it appeared in duplicated form, on page 200.

The supplement was praised by many, and frowned upon by a few. It has been said to be too mild and yet in one paper was described as a "scathing attack" on the critics. There is no need to expand further upon it here, for both the smog and the question of sulphur oxide emissions are dealt with on other pages, including the statement made in Parliament by the Parliamentary Secretary for Science, Mr. Denzil Freeth.

The editorial "Ten Years After" in our last issue, surveying the position a decade after the 1952 smog, was of course written before the 1962 episode. We had said that "much more progress towards clean air must be made before we can be confident that the killing smog is no more". Despite the fact that the consequences of 1962 were so much less serious, and despite even guarded agreement with the official view (as expressed by Mr. Freeth), we still believe that, given a combination of adverse circumstances, something on the scale of 1952 could recur. True, the chances of this are diminishing all the time, but there is no room for complacency.

Mr. Freeth described the reasons why the Clean Air Act may have reduced the sulphur in the smog. It is true that the highest readings made in 1962 was greater than the highest recorded in 1952, but in both cases the readings are so isolated, both in space and time, that no conclusions can be drawn. One important factor must be noted. This is the greater space heating load from the higher buildings now rising, and continuing to rise, in our city centres. Every cubic foot of room space has to be warmed (and heating standards have gone up too) during the winter months, so that in many city areas it must be true to say that clean air measures have prevented what might have been a serious rise in pollution.

Fuel Freeze

The foggy thinking about the smog had scarcely dispersed when the cold came, with its power cuts, low gas pressures and a swiftly growing famine in solid fuel. Because solid fuel became so difficult to obtain more and more demand was made upon gas and electricity, in addition to the increased demand from their normal users. Complaints, denunciations and bright ideas grew to almost blizzard proportions. To what extent capital should be invested in generating stations and gasworks to meet the excess demands that come perhaps only once in ten or twenty years; in what ways solid fuel distribution can be organized to meet these conditions; and how better use can be made of the available heat, through more efficient appliances and insulation—these are among the questions that must be given attention.

But there is no case for blaming clean air progress for the trouble, on the ground that it encourages too much the use of electricity and gas; or for suggesting that the programme should be suspended until there is a surfeit of power stations. On the contrary, clean air measures help towards a better load factor for gas and electricity, and by encouraging the more efficient use of solid fuel can help in reducing the sudden, devastating demand that was one of the major causes of the recent difficulties. The greater use of openable stoves, for instance, burning smokeless fuels that are in good supply, together with improved storage facilities, would materially reduce the strain on fuel haulage and local delivery.

The one serious problem that arose in some areas during the crisis was the position of those in smoke control areas where, temporarily, the only fuel that could be obtained happened to be bituminous coal. There is provision in the Clean Air Act for the suspension of smoke control regulations in emergency, through an order to be made by the Minister, but it was not found necessary to make use of this power during the recent crisis. Some authorities did, however, find it necessary to let it be known that they would not, for the time being, take notice of contraventions. Provided that the situation is kept under control and that abuses are not allowed to creep in, this seems to be commonsense. After all, in the conditions we have experienced, it is better to be warm than to be clean.

Just Indignation

To use John Evelyn's phrase, our just indignation over attacks on the Clean Air Act does not arise because we think the Act is beyond criticism, but simply because it is the best Clean Air Act we have. Our concern is not on an academic plane but is purely practical. Denigration of the Act or of smoke control policies on grounds that are manifestly unsound would, if unchecked, make it increasingly difficult to achieve progress. And, frankly, to judge from the Press reports and correspondence we have received recently, the matters discussed above have led to a setback which will require an extra effort to overcome. Complaints and expressions of disgruntlement, expressed mainly in the local Press, have been widespread. Many are without substance, revealing only sheer and irremediable cussedness, or some failure in public relations, but others are genuine cases of trouble of one kind or another. It must be remembered that such stories make news for the local papers, whereas there is no compulsion to write about satisfaction, and it isn't news anyhow. But, even though the number of complainants is only a minute fraction of what is now quite a large total, the existence of any at all shows the need for continuing and improving the work of explanation and education, of making sure that fuel problems do not arise, or are dealt with as soon as they do, and of ensuring genuine approval rather than mere acquiescence. As the Government report on smoke control shows—and as our graphs reveal at a glance—there is still a very long way to go in smoke control. The Society will, of course, do everything it can to assist its local authority members in their task.

THE IMAGE OF THE NORTH

Unemployment. Dying industries. Drift to the South. Poor old North!

The discussions and lamentations in recent weeks about the growing imbalance between the north and south of Britain have not been the most cheerful reading for the Northerner. A picture has been painted of a large part of our island becoming poor and derelict, and of the other part, the south, and particularly the south-east, becoming one vast new urban area, prosperous and humming with modern industrial activity. Exaggerated though it may be, there is some truth in it, and the continuing trend of the southwards drift is serious. Forecasts of how the drift will continue accentuate the situation as it actually is, for they help to build up an image of the North that makes it more difficult to halt or reverse the process. In the eyes of the South there has always been an image of the North as being dark, dour and dirty. If this is strengthened, then it becomes increasingly difficult to attract to the North the new industries, the capital, and—most important—the keen younger generation of technicians and trained executives. If the North is to be reborn it must create a new and attractive image.

We include Scotland as part of the North, and Mr. P. D. Coates put his finger on the right spot when, in the address at Bolton reported in our last issue, he said:

> "The Report of the Toothill Inquiry into the Scottish economy said that places wanting to attract new industries should make themselves clean and attractive, as industrialists and key workers may be put off by their impressions of a dirty, physically unprepossessing town. It said that clean air was perhaps the first need in this respect, because without clean air the scope for other improvements was more limited, and it referred to the 'depressing tenacity' with which soot adhered to the older parts of Scottish towns. May not these remarks contain a lesson for England as well as for Scotland?"

This is something that this Society has for many years tried to drive home, and it certainly applies to all the industrial areas and conurbations in the North as well as to Scotland. Too many fine towns and cities are still regarded as dark, dour and dirty, despite the improvements that today can be seen in their appearance and in their air. The old image persists, and a new one is needed. Clean air—and a clean-up—is of more vital importance to the North than it is to the industrial towns of the South, including London, and the effort to secure it should be correspondingly greater. And yet, as is shown in the review on another page of the new report on progress with smoke control areas, it is the North that is making least progress. It is true that, saddled with the mills and factories, and much housing, of the nineteenth century, the North has a heavier task than has the South, so that there is a need for much greater effort and determination. But surely, to the Scot, the Northumbrian, the Lancastrian and the Yorkshireman, this should be a challenge to be met and not an excuse for apathy?

It can be done, because it has been done. The City of Pittsburgh was faced with exactly the same problem. Old industries, some running down, old smoke-blackened buildings, a foul atmosphere, unable to attract new industry, the city was beginning to die. But its citizens got together, galvanized the municipality and the business community, and set to work to create a new Pittsburgh. Advanced air pollution control made the city one great smokeless zone, ambitious replanning and rebuilding was started, civic pride was fostered and grew apace, and a magnificent new Pittsburgh was born.

If the North can capture the Pittsburgh spirit and make the effort it too can shatter the old image and create one that will attract and no longer repel.

The Society's Affairs

The programme is now being completed for the annual Conference at Scarborough on October 8 to 11. This year the proceedings will begin on the Tuesday morning and will end, with a special Technical Session (on dust and grit removal problems) on Friday morning. In addition to the paper that will be presented there will be a film show and the opportunity for participation in visits to works and installations in the Tees-side area. The Clean Air Exhibition, which like the Conference will be held in the Spa buildings, is already assured of success and should well maintain the high standard we have reached for this event. Fuller information and formal invitations will be sent to members during May.

Before the conference there will be the Annual General Meeting on April 17 in the Assembly Hall of the Royal Commonwealth Society in London. In the afternoon there will be a meeting that has already been announced to members and representatives, at which there will be a series of short and informal addresses by well-known authorities on the December, 1962, smog. Readers who, not being members, have not had notice of this meeting are invited to attend, and full details will be sent on request.

Between the two meetings on April 17 there will be a lunch, in the same building, about which information has also been sent to members. Tickets are 25s. each and as numbers are limited to 150 immediate application is advised.

The lunch will be an opportunity for meeting the new President, whose election will have been announced at the AGM. It is the first occasion on which the Society has held a luncheon of this nature, and it may be regarded as an experiment which, if successful, might become an annual event.

BRONCHITIS AND AIR POLLUTION

Brief reference only is possible for two statements on air pollution and bronchitis, made as we were going to press. The first was in a debate in the House of Commons on February 15, in which the Joint Parliamentary Secretary, Ministry of Health (Mr. Bernard Braine) stressed the relationship. On the argument that it would be better to concentrate on dealing with the oxides of sulphur instead of visible pollution he said: "This is quite wrong. What is more it is dangerous. I hope no local authority in a polluted area will be deterred from making a smoke-control order by arguments of that kind". He went on: "The truth about pollution by sulphur is that it has never been satisfactorily shown that sulphur dioxide, the commonest sulphur compound, is by itself harmful to health in the quantities in which it is found in the air."

The second reference is to the Report on Bronchitis of the Scottish Health Services Council (Scottish Home and Health Department, H.M.S.O., 4s.), an authoritative medical survey, which indicts air pollution as one of the main factors in the high incidence of the disease. The key paragraph on air pollution is: "We have noted with interest the attempts which are being made by local authorities to promote clean air in Scotland. The evidence incriminating atmospheric pollution is compelling and there can be no doubt that the freeing of the air of the products of combustion, both visible and invisible, is likely to play a significant part in reducing the prevalence of this disease. This programme should be pursued with the greatest energy."

THE DECEMBER SMOG

A First Survey

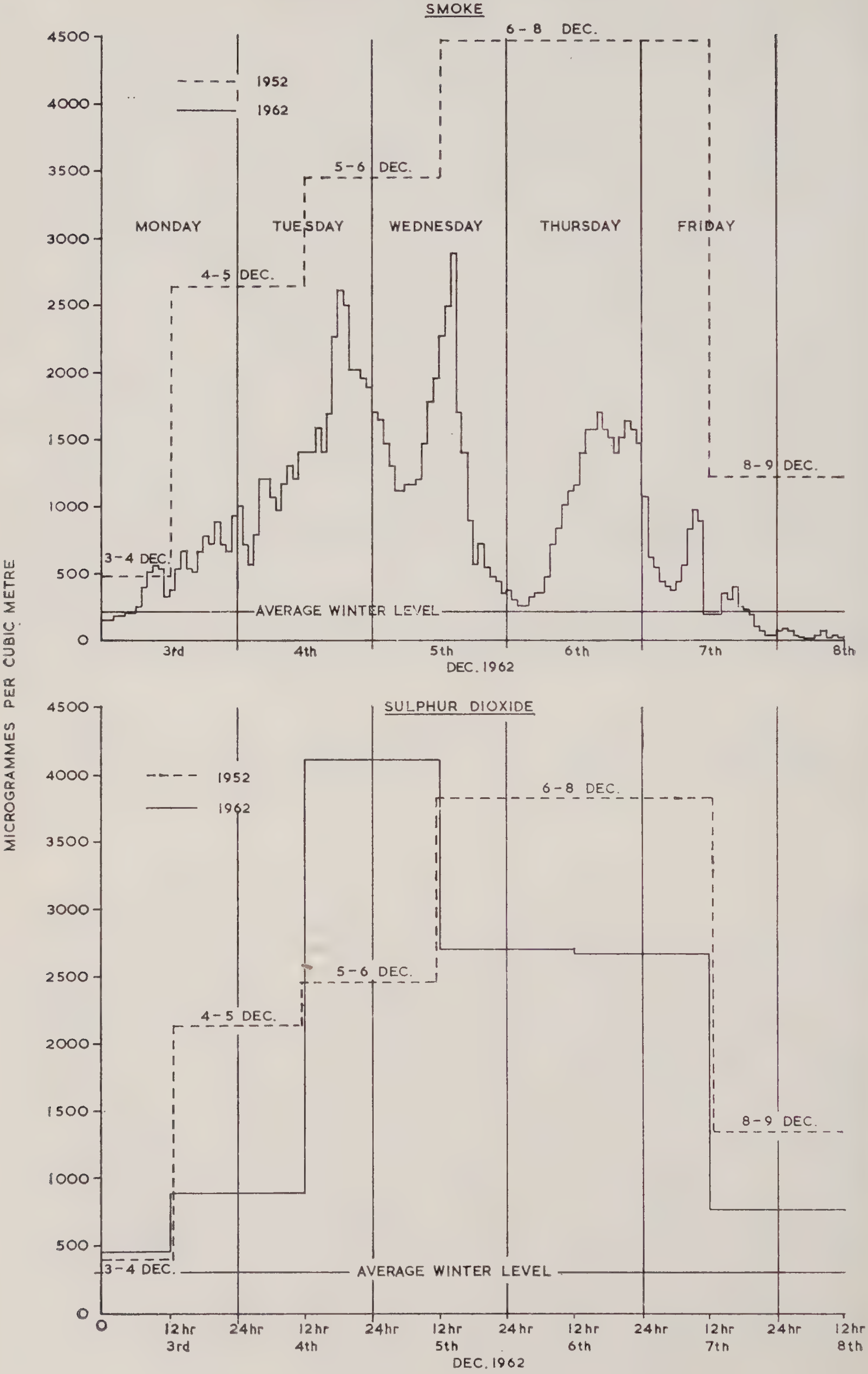
THE fog which developed on Monday, December 3, 1962, and did not clear until the following Friday, affected many parts of Britain, varying considerably in different places and at different times. The area most affected was the South-East of England, and as in 1952 the most dense and persistent fog was over London and the Thames Valley. The effects in certain other cities are noted separately, and the following report relates only to London.

The fog, which rapidly became smog, has been widely compared to the 1952 episode, which occurred between December 4 and 9. On that occasion the fog lasted rather longer and appears to have been, generally, somewhat denser and more persistent. In considering the effects upon health the fact that the fog duration was shorter in 1962 than in 1952 is less material than might appear, for in the earlier episode most of the deaths and illness occurred on the first and second days.

The depth of the fog, or height of the inversion, was similar on both occasions, namely, 300 to 400 feet, and as the photograph above shows, high points were at times above the fog and in bright sunshine. Temperatures in low-lying areas in 1962

Helicopter photograph above shows a hole in the smog over Shooter's Hill, London, S.E.

FIG. I SMOKE AND SULPHUR DIOXIDE AT ROOF LEVEL, COUNTY HALL, DECEMBER 1952 & DECEMBER 1962



were a little lower (about 1°C.) than in 1952.

The full records and other data are not available as we go to press, and it is hoped that fuller reports will be given at the meeting of the Society to be held on April 17. The contributions that are to be made on the different aspects will be reported in full in the Summer issue.

The Pollution

At the time of going to press no information was available for publication on pollution recordings from the Department of Scientific and Industrial Research, but a report has been issued by Dr. J. A. Scott, Medical Officer of Health, London County Council. We reproduce two of the figures accompanying this report, one showing recording made at County Hall during the 1952 and 1962 episodes, and the other showing the comparative amount of smoke and sulphur dioxide during the fogs of 1956, 1957 and 1962. It will be seen that there is a significantly progressive reduction in smoke, and although as yet only 25 per cent. of the London area enjoys full smoke control, the value of the Clean Air Act is clearly demonstrated.

The sulphur level, on the other hand, shows no such reduction, and from the figures available the peak concentrations in 1962 were similar to, or may at times have exceeded, those of 1952. This could be expected from the increased amount of heating, especially in the central districts, during the last decade.

Mortality and Morbidity

Figure III shows the weekly deaths, from all causes, in the Administrative County of London, from the Registrar-General's returns, for the weeks before, during, and after the smogs of 1952 and 1962. The deaths for Greater London (the frequently quoted figure of 4,000 for 1952) are not yet available for 1962.

For the Administrative County, Dr. Scott states that the number of deaths attributable to the fog conditions total some 340, one-third of them being in persons under 70 years of age (mostly 45-69 years) and the remaining two-thirds in old people.

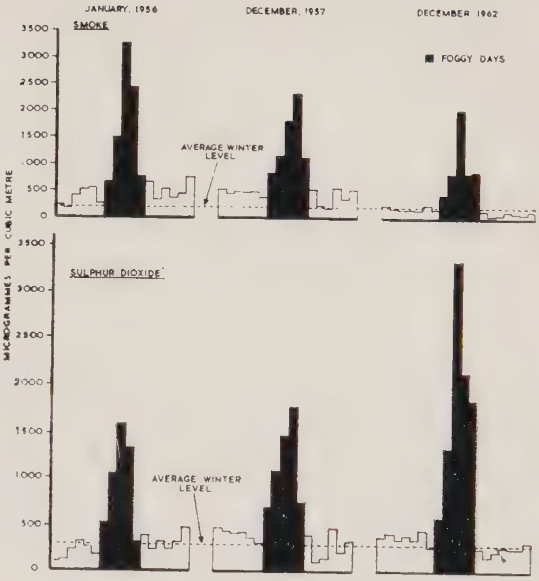


Fig. II. Smoke and sulphur in the fogs of 1956, 1957 *and* 1962, *at County Hall*

His report continues: "The peak day for deaths in persons under 70 was Wednesday, December 5 (the middle and most severe day of the fog) when the number of deaths rose sharply from 58 on the first day, 69 on the second, to 105; subsiding to 76, 91, 78 and 62 on the four following days: with old people the effect was more gradual and continued longer. The impact was sharper on persons of middle age who would have been out and about their work. Of the causes of death during the fog and the week after the greatest proportionate rise was in bronchitis.

"For morbidity, the best measure available (though it covers only the working population) is the figure of *new* claims for sickness benefit under the National Insurance Act received in the London offices of the Ministry of Pensions and National Insurance; in the week ended Tuesday, December 11, they showed a 50 per cent. increase over both the previous and following weeks."

"Compared with previous episodes excess mortality was of the same order as in 1957 and about three-quarters of that in 1956; in the 1952 smog there

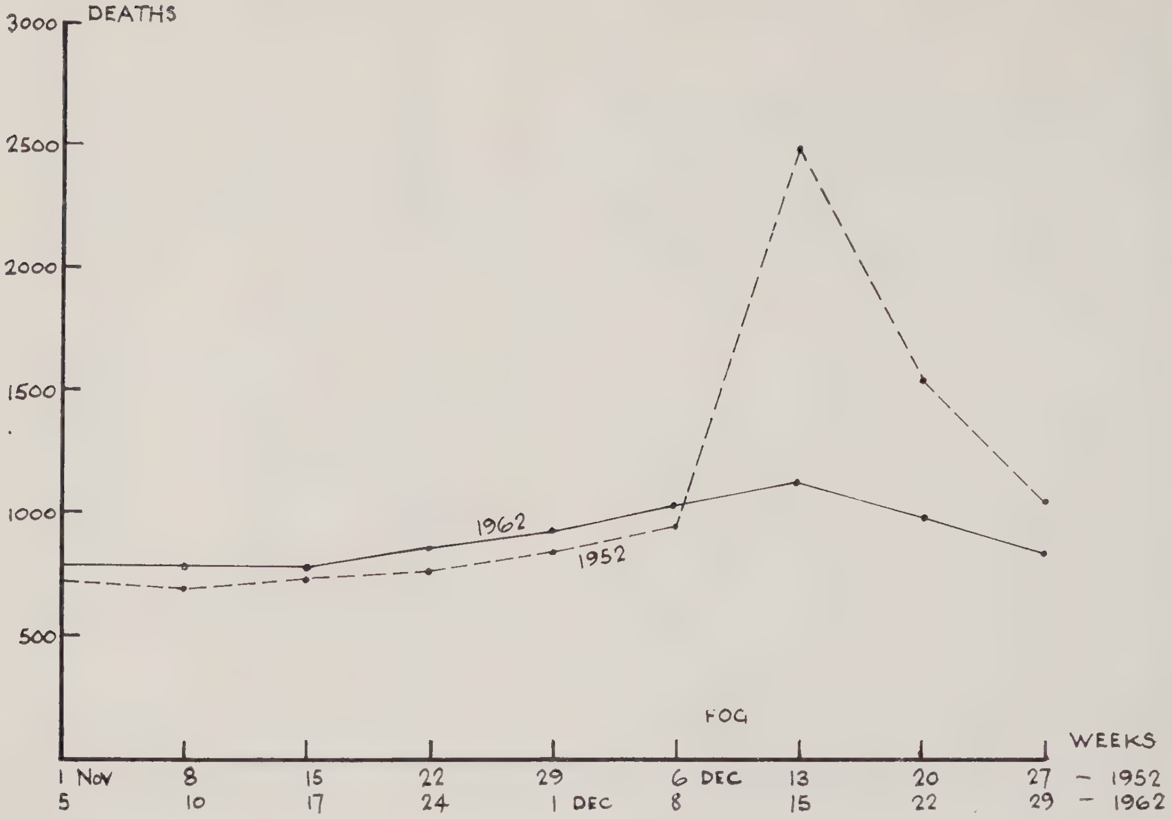


Fig. III. Total deaths, London Administrative County, during the 1952 *and* 1962 *smogs*

were about 2,000 excess deaths. A feature of the last three episodes was that in 1956 when there was most smoke it was the old who died; in December 1957 and 1962, when there was more sulphur dioxide, the under-seventies were also affected, especially is this so with the morbidity figures which on this occasion showed a sharper rise than in either 1956 or 1957."

Commenting on the observed improvement in the ratio of smoke to sulphur Dr. Scott noted four factors that are likely to have contributed to this:

(*a*) The Act provides better control of industrial emissions.

(*b*) 25 per cent. of domestic premises have now come under Control orders.

(*c*) In many other premises the requirements of the Act have been voluntarily accepted.

(*d*) The tendency for replacement of small dwellings by blocks of flats has led to more efficient methods of combustion and the discharge of chimney effluents at greater heights.

The reduced effects on health may be attributed, concludes Dr. Scott, "in part to the reduction of smoke and associated components of pollution, and in part to the publicity which has been given to the harmful effects of smog. Such publicity has lessened the unnecessary exposure of the more susceptible individuals and encouraged the use of 'smog masks' and extemporized filters such as scarves and handkerchiefs among those in the streets during the peak periods."

Public and Press

After the 1952 episode this journal deplored the comparative indifference in the Press and elsewhere with which it was treated, and we quoted an even more indignant editorial from *Weather*, which wondered what the outcry would have been if there had been such a deathroll from any other cause. In 1962, however, the position was reversed, and in some London papers especially the smog was given the full sensation treatment. So much so that the air pollution conference at Washington (see page 212), being held about the same time, was very anxious about what seemed to them to be another major calamity. Reports such as the following, from an American medical journal, were published:

> "A choking, chemical-laden smog settled over Greater London for four days this month and created a major medical crisis. Officials said the air pollution compared to that in the epic fog of 1952, which killed 4,000 persons. A run on smog masks quickly depleted store supplies, and pedestrians improvised their own protection with handkerchiefs and scarves. The number of persons collapsing and dying in the streets rose to three times the normal rate. . . ."

The Society's Supplement to this journal, recorded on another page, sought to restore the balance and get the facts in perspective. The press publicity given to this statement further helped to this end. The only criticism came from an article in the *Economist*, which rarely if ever has shown an interest in clean air. This accused us of complacency, and said that the Society "of all people might have been expected to throw up their hands in horror", and that the Supplement was "a scathing attack on those newspapers and television commentators who thought the visitation evil enough to merit their attention and dirty enough to merit attacks on the efficacy and operation of the provisions of the Clean Air Act." As in the last issue (which went with the Supplement to this paper) we had written that "much more progress must be made before we can be confident that the killing smog is no more", and that it was disappointing "we were still creeping towards clean air", the charge of complacency is very odd. (A letter replying to the paper's criticisms was not published.)

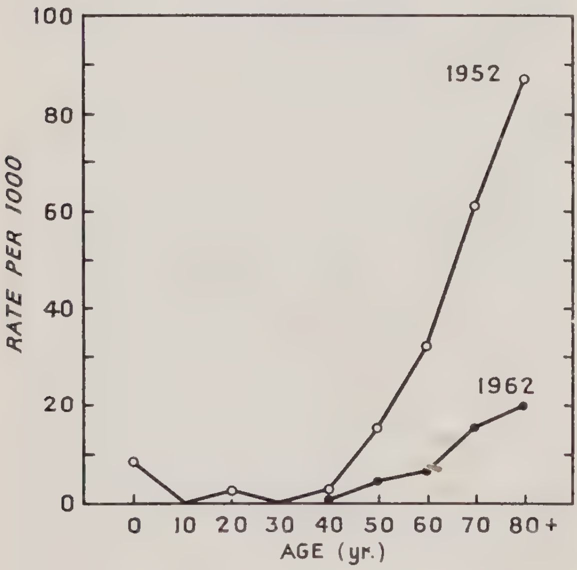
That it was better not to hold up our hands in horror, and to add fuel to the sensational treatment of the smog, was amply supported by the following news report from the *Croydon Times*:

> "Sufferers from asthma and bronchitis had been "frightened to death" on reading national newspaper headlines talking about 'killer smog', Dr. G. P. Baker told the monthly meeting of Croydon Group Hospital Management Committee last week.
>
> He described as 'deplorable' the treatment of news, by sections of the press about the effects of the recent smog on people with chest complaints.

The tower at the Royal Military College, showing through the fog. (Photo by courtesy of the "Daily Express")

> Some of his patients had been ‘terrified’ because of the headlines, most of them unnecessary. In fact, Croydon had escaped lightly during the period of smog.
>
> The management committee was told that there had been only about a dozen admissions to hospitals in Croydon and surrounding districts that could be directly attributed to the smog.
>
> Dr. M. McClean, a Norbury practitioner, supported Dr. Baker’s statements about press headlines. “Many people were awaiting death as a result of reading them”, he said.

Among other press items was a leader in the *Guardian* that went nearly as far as the *Times* in suggesting that because of the sulphur the smoke was of small account, but it made amends in a day or two with two excellent full articles on the nature of fog and smog and the medical aspects, by well-informed science and medical correspondents. A letter emphasizing that conditions in the City of London would have been far worse if it had not been for the smoke prevention measures already achieved, from Mr. Stanley E. Cohen, the Society’s Treasurer, writing as Chairman of the Port and City of London Public Health Committee, was published in the *Times*. Reference is made elsewhere to the valuable letter, in the same newspaper, from the Society’s Past-President, Dr. R. Lessing.



The above diagram accompanied a letter to the Lancet (*December* 22, 1962) *from three general practitioners, on the effects of the smog on patients to a general practice in the Beckenham area. One of the writers, Dr. John Fry, published a similar survey in the* Lancet *after the* 1952 *episode, and the diagram compares the two. In* 1952 *the patients were treated for acute chest infections at a rate of* 9·5 *per* 1,000. *In* 1962 *the rate was* 2·4. *In* 1952 *there were two deaths; in* 1962, *none.*

IN THE PROVINCES

Reports from Medical Officers of Health showed that the December fog episode affected the main centres of population with varying degrees of intensity. Severity was a common characteristic however and low temperatures, were general.

At Birmingham fog patches were recorded as early as November 24 and by December 8 the weeks total of deaths from respiratory illness, 41, was the highest since the beginning of October.

The Manchester report contained the welcome news that the lowest smoke readings taken during the peak period of the fog occurred in the smoke control areas of Brownley Green and Wythenshawe and the next lowest in the smokeless zone of the city centre. Two areas not yet subject to smoke control recorded the highest smoke concentrations and one of them, Crumpsall recorded the highest sulphur dioxide measurement, but tied with the City Centre for first place.

There was no significant change in mortality rates and no records are available regarding respiratory disease morbidity. Significantly, for the first time, the general public became aware of the distinction between smoke and its effects and sulphur dioxide and its effects and realized that smoke control did not mean the automatic elimination of sulphur dioxide from the atmosphere.

In Leeds the fog was particularly dense on December 4 and 5. Records of smoke and sulphur dioxide concentration were taken at nine points in the city and marked increases were noted. The cold weather preceding the fog had resulted in householders using their domestic open fires for long periods. The highest recorded level of pollution occurred in an industrial area situated in the lowest part of the city. Deaths rose a little, the figures for respiratory diseases being the highest yet recorded this winter.

Glasgow reported a typical smog on one day only, December 5. That week the city recorded increases in deaths from pneumonia and bronchitis, a large proportion being elderly people.

The main characteristic of the fog in Salford was an increase of nearly 400 per cent. above the normal December average in smoke pollution measurement on the second day of the incident. Visibility was down to ten yards. The increase in sulphur dioxide pollution was over 300 per cent. above the December average. No great change was noted in the mortality figures.

THAT WAS THE FOG . . .

London last week looked as if it had slithered to the bottom of the Thames. Smothered by smog as fetid and impenetrable as river sludge, traffic stopped, airports closed, and more than 100 ships swung helplessly at anchor. For four days and nights, the dark satanic peasouper dumped grit and grime over 22 counties, cocooned 125,000 miles of icy roads, and caused 20,000 automobile breakdowns. . . .—From *Time*, New York, December 14, 1962.

The loss of revenue to Britain's state airlines on account of the December smog in London is estimated to be £500,000. B.E.A. had to cancel some 500 services and found it possible to operate only a fractional 30 in four days out of Gatwick airport, where the sun persisted in shining.

Harrogate Conference, 1962—The Proceedings of the Conference, 112 pages, with all papers and discussions has now been published. The price is 15s.

Clean Air and Productivity—The special NPY poster "Why Clean Air Aids Productivity" (see last issue) is now available. 30 x 20 in. 10s. each, 5s. 6d. per 10. post included.

Obituary

We regret to have to record the death of one of the Society's most distinguished Vice-Presidents, Viscount Samuel, P.C., G.C.B., O.M., G.B.E. He had held this office for many years, though unfortunately never becoming President, and his interest in clean air dated back, at least, to the time of his Chairmanship of the Royal Commission on the Coal Industry. Its most important report referred to the loss of potential derivatives from the burning of coal in the raw state, which also led to the air pollution that is detrimental to the public interest.

We also regret the death of Mr. Hugh Gaitskell, whose most direct, and very happy, association with the Society was the address he gave, as Minister of Fuel and Power, to the Cheltenham Conference in 1948. Those who were fortunate enough to be present will recall the brilliance of his words, both in the way in which he spoke and the warmth of his feeling on the subject, and on the lucidity and logic in which he put the case for clean air from the viewpoint of the economist and one whose concern it was to promote fuel efficiency.

From the Scottish Division we are sorry to learn of the death of Treasurer McKechnie of the Burgh of Barrhead. Mr. John Innes, President of the Division, writes: "This friendly Councillor will be missed in Scottish circles where his ardent belief and support for the Society's aims was inspiring and resulted in the recent establishment of his authority's first smoke control area. In recording the loss, we note that Mrs. McKechnie, who shared her husband's interests, has accepted office in the Council he served so well".

We record with regret the death of Councillor Mrs. E. Jones, J.P., a member of the Cannock U.D.C. Mrs. Jones represented her authority for many years at the Society's meetings and conferences. She became a member of the Urban Council in 1947, was its chairman from 1953 to 1955, and was elected a County Councillor in 1952.

IN PARLIAMENT: AIR POLLUTION AND THE DECEMBER SMOG

Air pollution was discussed in the House of Commons, on the motion for the adjournment, on 4th February, 1963. The only speakers were Sir James Duncan and the Parliamentary Secretary for Science, Mr. Denzil Freeth. We give a verbatim report of their speeches.

Sir James Duncan (South Angus): I rise tonight to comment on the fog which took place between December 4 and 7 last year. I do so for a number of reasons. First, I had to live through it. When I got home to Scotland that weekend I had to go to bed because I was so affected by it. Secondly, it coincided both last year and in 1952 with the Smithfield Show; and a large number of my constituents and a large number of animals from Scotland go to the Show to win prizes. In 1952, the fog was so bad that many animals had to be slaughtered on humanitarian grounds before even getting into the ring, so badly did they suffer from the fog. I am glad to say that in 1962 they all got into the ring, although one or two afterwards suffered inconvenience from the fog.

My third reason is that my constituency surrounds Dundee, where a good deal of argument is going on at the moment about the Clean Air Act and whether or not Dundee should proceed with the provisions of that Act. I would say, in passing, that one of the considerations before proceeding with the Act must be the reasonable accessibility and reasonable price at which smokeless fuels should be available. That is worrying the people of Dundee, because in this sort of weather the price of electricity, gas and the cost of smokeless fuels—and the availability of it—is causing a certain amount of trouble.

My fourth reason concerns the general merits of the Clean Air Act. In 1956, that Act was passed and it is fair to compare at this stage, in a short debate such as this, the difference between the 1952 fog and the 1962 one. In 1952, as far as I have been informed, 4,000 people died and an unknown number were treated in hospital. In 1962, 400 people died. These are comparable fogs lasting roughly three or four days each. During the 1962 fog a large number of people were also treated in hospital. Most of these people are old and are suffering from bronchitis and various lung and bronchial infections. It is a terrible affliction for the elderly, although I must admit that the casualties and deaths have been materially reduced.

The other factor in this short debate is that in the last fog there was fourteen times more than the normal amount of sulphuric acid in the atmosphere. It is this acid in which I am most interested, for to put the problem in a sentence: fog is an act of God, but smog is an act of man. I want to eliminate the smog from the fog. Three aspects are involved here: first, the effect of the Clean Air Act and what has happened since 1956; secondly, what is the promise for the future; and, thirdly, what are the scientific aspects?

I am grateful to the Parliamentary Secretary for Science and the Parliamentary Secretary to the Ministry of Housing and Local Government for being here tonight, since these two aspects are involved. I will deal with the Clean Air Act aspect first. It will be remembered that the object of the Act was to eliminate visible smoke, not to eliminate the poison. Although it is right that we should eliminate the visible smoke, in the future we must also try to eliminate the poison from our atmosphere in these conditions.

I should like to quote figures from

Command Paper 1890, "Smoke Control (England and Wales) 1962-1966", which reviews the progress made and prognosticates progress up to the final objective in the black areas. I shall deal only with London, although I could deal with every area in the country. I was once a London Member and, therefore, have a sentimental interest as well in this subject. It is clear from these figures that we are not making as fast progress as we might. The number of premises covered by Orders up to December 31, 1961, in Greater London was 505,000. It has been proposed that an additional 277,000 premises will be covered in 1962. The final objective is nearly 2½ million premises in Greater London, in the "black" areas. In the County of London 307,745 premises have been covered by Orders up to December 31, 1961, and 152,000 are expected to be covered by the end of 1962. But the final objective is 1,105,000 premises. We are a long way off the final objective.

We have reached in acreage in Greater London 19.4 per cent and 22 per cent of the premises. This again proves that we are a long way from our objective. This is left to the local authorities and their success has varied considerably. In Lambeth, for instance, it is not proposed to reach the objective until 1975. The same applies to Wandsworth. Battersea will not have completed the task until 1972. Fulham, on the other hand, hopes to reach its objective by 1964, and Westminster by 1965. I should like the Parliamentary Secretary to say, therefore, whether he is satisfied with this progress in Greater London, or, indeed, in the County of London, because by the progress in Lambeth, Wandsworth, Battersea and Westminster we in the House and the Palace of Westminster are vitally affected.

If conditions are such that the atmosphere does not move very much we in the Palace of Westminster will be affected by what happens in the neighbouring boroughs. Far greater urgency should be instilled into the progress made in implementing the Act in the London boroughs, so that these objectives shall be reached long before 1975, if that is possible.

This is not the whole story, because under the Clean Air Act local authorities are responsible only for the elimination of smoke and the transfer from ordinary coal fires to smokeless fuels in domestic premises. But I believe that the biggest danger from modern smog is not from domestic fires as much as from other agents which do far more damage to our lives and our health by the ejection of poisonous fumes.

First, there are the power stations. There is only one, Battersea Power Station, with a filter of any kind. None of the other power stations has any filter at all. It seems to me quite wrong that these great power stations, although their chimneys are high in the air, should be responsible for the emission of sulphuric fumes which convert themselves on reaching the atmosphere into sulphuric acid which is a deadly poison.

I hope, therefore, that the Minister for Science, in conjunction with D.S.I.R., is taking strong steps, as soon as a proper process has been discovered, similar to and perhaps better than the Battersea Power Station process, to produce a process which will be enforced on all power stations.

I would call attention to an article which appeared in *The Daily Telegraph* of December 20 last year, in which is described the *Reinluft* process, a German process introduced from Essen by a German professor. It is suggested that these sulphur fumes can be trapped by a dry system instead of the present Battersea Power Station wet system, and that sulphur dioxide can be trapped and converted into something that can be used again.

The Daily Telegraph stated:

> "Initial small-scale experiments with the *Reinluft* process by the D.S.I.R. 18 months ago had yielded promising results. A pilot plant has been installed and it is hoped to give a definite opinion on the process in two or three months".

Now that those two months are

over, can my hon. Friend say whether this *Reinluft* process is a success and what he is going to do to insist that these power stations adopt it if it is proved to be a success?

In these days hotels, factories and blocks of flats all use diesel oil for their heating, and it seems to me that in some atmospheric conditions this produces poisonous fumes. I am not concerned so much about the smoke. It is the poisonous fumes which are emitted when mixed with the atmosphere which produce sulphuric acid. This is coming down on the streets and the people of London, even on the policemen, who probably have to use the streets more than any other Londoner. As my hon. Friend will probably remember, they had to use smog masks last time we had a fog, in order to be able to work in the streets.

What is being done to see that filters are used to prevent these poisonous fumes from being emitted from these places? Nothing at all at the moment. They do not come within the Clean Air Act provisions, and it seems to me that the time has arrived when our scientists should be able to produce something which will filter the poison from these emissions so that the people of London can live without being poisoned in conditions of fog.

My other suggestion is that the time has now arrived when we ought to take more seriously the diesel fumes coming out of buses, taxis, heavy lorries, and so on. They emit their fumes at street level. Even my tractors on my farm, which use diesel fuel, emit fumes above the head of the driver. But in London these fumes come out at street level, and people who have to use the buses and have to be out in the streets have to absorb these poisonous fumes day in and day out.

Whereas in normal atmospheres and conditions the wind carries the worst of these poisons away, and in other cases they become absorbed into the atmosphere, in fog conditions these fumes hang about the streets at human level. It seems to me that again it should be possible to put some sort of filter on the exhaust of diesel vehicles so as to eliminate the danger of the exhalation of poisonous fumes.

The Clean Air Act has done quite a lot, but it has hit, so far as I can make out, the domestic consumer of coal, the domestic consumer of heat, more than the industrialists, more than the big hotel keeper or the owner of a big block of flats, or the power stations. What we have got to get at is the big industrialist, the big power station, the big hotel, to see that they do not poison the people of London.

I therefore trust that my hon. Friend will be able to give the House not only a hopeful exposition of the progress of the Clean Air Act, but also that he will, from the scientific point of view, give us some hopeful news about the elimination of the horrible, poisonous fumes which we have to suffer from time to time in London and in our other great cities.

The Reply

The Parliamentary Secretary for Science (Mr Denzil Freeth): I am very grateful to my hon. Friend the Member for South Angus (Sir J. Duncan) for giving me this opportunity to report upon the smog which hit London and the Home Counties last December and to discuss the effects upon it of the working of the Clean Air Act and the research which has been completed in the past; and also to say something about the research now going on, from the results of which we shall hope to benefit in future years.

Perhaps in the short time available to me I should leave to my right hon. Friends the Minister of Power and the Minister of Housing and Local Government the questions of availability of smokeless fuel and the quicker implementation of the Clean Air Act. I am supported tonight by the presence of my hon. Friend the Joint Parliamentary Secretary to the Ministry of Housing and Local Government who will have taken note of the points which my hon. Friend has made.

Smog is, of course, the result of weather conditions preventing pollutants in the air from blowing away with the result that they are retained near ground level. Now, air pollution, as my hon. Friend said, is clearly unpleasant, dirty and detrimental to property. It certainly has an effect on health, but such effects are not always quite what is popularly believed, or even which have been printed recently in the Press. Smog is a complex mixture of particles, droplets and gases and among the pollutants suspected of having an ill effect upon health are smoke, sulphur dioxide and sulphuric acid, upon which my hon. Friend laid emphasis.

Experiments with pure sulphur dioxide alone, in concentrations such as have been found in smog have so far failed to produce consistent effects on the functions of the lungs. But the results of recent research do suggest that the action of irritant gases, such as sulphur dioxide, may be enhanced by the presence of inert particles of salts or acids and there is even some good evidence that the chemically inert particles alone may make breathing difficult. Town smoke is rich in certain hydrocarbons which are capable of producing cancer in the skin of animals.

These problems are being investigated by the Air Pollution Research Unit of the Medical Research Council, for which my noble Friend is responsible. This unit is sampling and analysing the air in streets, bus garages and tunnels, and the significance of the polluted air, particularly in relation to lung cancer and chronic bronchitis.

The Council has also awarded grants in support of studies on the relationship between air pollution and death rates from lung cancer in various rural and urban districts of England and Wales, and results have shown that mortality from lung cancer is greater in smoke polluted areas, such as the large towns. So far no specific constituent or characteristic of air pollution can be accused of causing death. But 3,4 benz-pyrene and certain other hydrocarbons found in smoke are thought to be particularly important in relation to lung cancer, and smoke, sulphur dioxide and sulphuric acid in the case of bronchitis.

In addition, morbidity and mortality studies are undertaken by the Medical Research Council's Statistical Research Unit, partly in conjunction with London Transport Executive. I must tell my hon. Friend, in view of what he said about diesel fumes, that there is no evidence of significantly greater mortality from lung cancer for men working in diesel bus garages than elsewhere. I think that this is a very significant fact.

I turn now from the general to the particular, that is, to the effects of last December's smog compared with that in December, 1952, when the smog lasted for one extra day but during which the weather conditions were no more unfavourable than at the end of 1962. I agree in general with the figures for extra mortality as a result of the smog quoted by my hon. Friend, although I should not like to commit myself as being certain that the figure of 400 is right for 1962. We have not yet got all the statistics and we have not, therefore, been able to make an accurate analysis of them. However, I think it is true to say that a very great improvement has been made. My hon. Friend was able to refer to a similar improvement with regard to the animals up for the Smithfield Show.

I believe that this improvement has been due at least in part to the implementation of the Clean Air Act. In 1952, emission of smoke for London as a whole was no less than 141,000 tons. In 1960, the last year for which I have accurate figures, the total had fallen to 89,000 tons, a decrease of about 37 per cent. It is reasonable, therefore, to assume that the smoke concentration in last December's smog in London was nearly 40 per cent less than ten years before. In the period between 1955 and 1960, the period covered after the beginning of the operation of the Clean Air Act, the fall in smoke emission was 32 per cent. Of course, further to reduce the emission of smoke is one of the main aims of the Act.

When we come to sulphur dioxide, however, there is likely to have been an increase in the amount over the figure for 1952, as a result of increased fuel consumption arising from greater power and heating requirements. My hon. Friend will be familiar with the work of the Alkali Inspectorate, but I believe that the Clean Air Act has probably indirectly reduced the amount which might otherwise have been present. There are three ways in which this may well have happened.

First, in smoke-control areas coal for domestic heating is often replaced by coke, and only 80 per cent by weight in the amount of coke, compared with the amount of coal is needed to maintain the same standard of comfort. Leaving aside, therefore, any improvement in such standards—I agree that they may well have taken place—as, on average, coke and coal contain the same percentage of sulphur the change from coal to coke should have reduced the amounts of oxides and sulphur emitted by about one-fifth.

Secondly, as a result of smoke-control areas many householders are changing from coal fires, to electric, gas or oil heating. The first of these, electricity, eliminates sulphur dioxide pollution at the point where the electricity is consumed, while gas and oil reduce it by 97 per cent and 95 per cent respectively. My hon. Friend referred particularly to oil heating. I know that he will be glad to learn how relatively harmless it is in this respect. Thirdly, the removal of smoke lets more of the sun's heat through the atmosphere, thus setting up convection currents and adding to the dispersion of pollutants.

Quite frankly, I have to tell the House that an economically acceptable solution to the problem of pollution by sulphur compounds is difficult to envisage unless some radically new brilliant ideas are produced. Sulphur can be removed from the lighter fractions of petroleum oil but the possibility of doing this economically with the heavier fractions is rather remote.

It is true that the power stations at Battersea and Bankside—not only Battersea—remove over 90 per cent. of the sulphur dioxide from their flue gases by washing them with water from the Thames and in 1961 no less than 24,000 tons of sulphur dioxide were removed in this way. But these washing processes are very expensive and can only be applied to large installations and only where there are ample supplies of water. There is also the further complication that the washing cools the flue gases, so that in certain weather conditions they come down to ground level rather than being harmlessly dispersed into the upper air. The Department of Scientific and Industrial Research is, therefore, undertaking a dual programme of research to help to remove or disperse smoke and sulphur pollutants.

The Clean Air Act gives local authorities power to control the height of new chimneys, and a study of the dispersion of chimney gases from high, isolated chimneys is being undertaken by the Central Electricity Generating Board and the Warren Spring Laboratory of the Department of Scientific and Industrial Research. At the request of the Federation of British Industries, Warren Spring is studying the dispersion of flue gas in relation to the chimney's surroundings, and dispersion from multiple sources, such as all the chimneys in a single built-up area, is being studied by the Laboratory. A detailed investigation on these lines is being made in Sheffield in conjunction with the Department of Geography of the university there. With the help of local authorities, a national survey of smoke and sulphur dioxide is being conducted by the laboratory to assess the effects of the Clean Air Act and to see what further action is most urgently needed.

Secondly, the Warren Spring Laboratory has carried out laboratory tests into the *Reinluft* process, to which my hon. Friend made reference. The point is that we have already done laboratory tests, and a small pilot plant has now been built to treat about 16,000 cubic feet of gas an hour. There are still a number of problems to be solved of a chemical engineering nature, such as ensuring correct working temperatures without causing fires in the absorbing material, and these must be solved before a detailed scientific and economic appraisal of the process itself can be made.

I must tell the House that there are considerable technical difficulties to be overcome in scaling up a process of this nature from the laboratory bench to full industrial scale. The work at Warren Spring Laboratory represents the first stage of the scale-up process, and the results of this work should indicate whether it will be feasible to scale it up further to suit really large plant. The Warren Spring Laboratory is keeping the C.E.G.B. fully informed of the progress of this work.

I am not yet ready to answer a specific question with regard to time, to which my hon. Friend referred.

Sir J. Duncan: What about cost?

Mr. Freeth: Cost is still one of the questions yet to be answered.

I said earlier that there was no evidence that the exhaust fumes of diesel engines produced cancer or chronic bronchitis. Nevertheless, this provides no excuse for neglecting to deal with offensive smoke from the exhausts of diesel-powered vehicles. It has been conclusively shown that such vehicles which are properly maintained, properly driven and not overloaded, do not emit smoke. The Warren Spring Laboratory is collaborating with the Ministry of Transport in devising test procedures for the roadside measurement of exhaust smoke from badly maintained, badly driven or overloaded vehicles. In addition, the British Internal Combustion Engine Research Association is studying the effect of combustion system design on the concentration of nitrogen oxides in the exhausts of diesel engines. This research association is grant-aided by the D.S.I.R.

Another grant-aided research association, that of the motor industry, is looking into the exhaust fumes from petrol engines which contain carbon monoxide and hydrocarbons which may be harmful to health. The association is also co-operating with member firms in the study of the problems of completing the combustion of constituents in the exhaust gases of motor cars, as well as in the development of both direct flame and catalytic after-burning devices.

I hope, therefore, that my hon. Friend will agree that, partly as a result of the Clean Air Act and action taken under it, and partly of past research, the effects on health of last December's smog, though to be deplored, were not as bad as those from the smog of 1952. I hope that my hon. Friend will also agree that the programmes of research to which I have referred and which are being undertaken, or financed, by the Medical Research Council, the D.S.I.R., the C.E.G.B. and various grant-aided research associations show the Government's determination to try to reduce future amounts of smog and its harmful effects.

I can assure my hon. Friend that no promising line of research is being neglected through shortage of funds. In addition, the progressive implementation of the Clean Air Act will play a major role in making and keeping the air of Britain clean.

Sir Gerald

We extend our congratulations to Sir Gerald Nabarro, M.P., for the honour of a Knighthood he has received. Among the public and political services that have so been recognized, we would place high the public service he gave to clean air in the passing of the Clean Air Act, 1956, preceded and stimulated as it was by his own Clean Air Bill.

Sulphur in Diesel Fuels

In reply to Dr. Stross, M.P., it was stated in the House (Feb. 27) for the Minister of Transport that "the amount of sulphur in the atmosphere derived from diesel vehicles is small in comparison with that derived from domestic and industrial fires and no effects on health have yet been demonstrated. The sulphur content of diesel fuel for road vehicles in this country has been substantially reduced in recent years with a view to increasing engine life".

Ministry's Report Spotlights Laggards

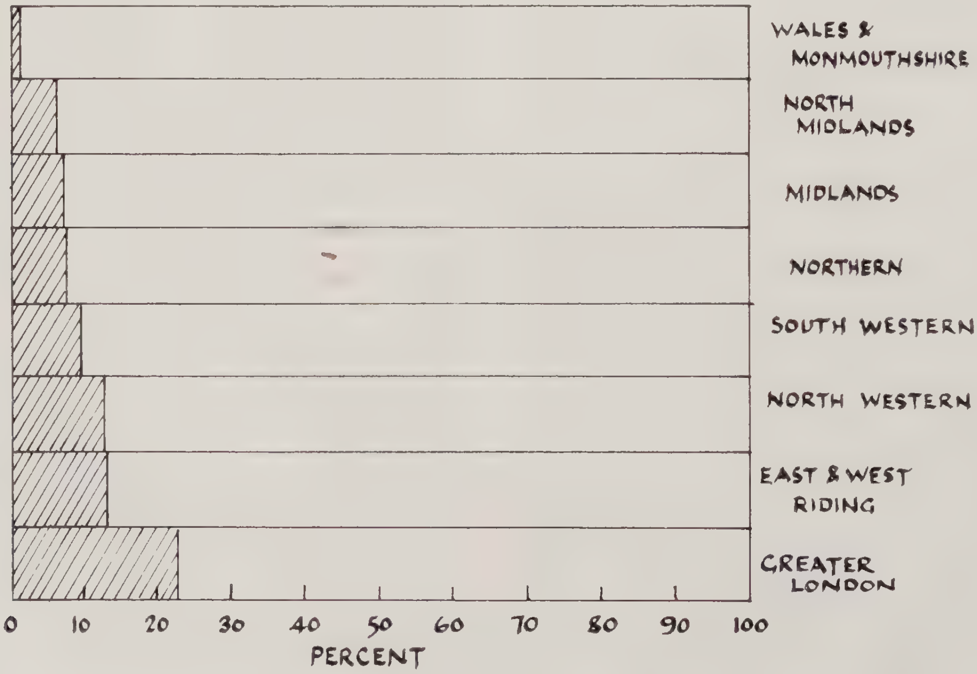
NEW PUBLICATION ON SMOKE CONTROL

Smoke Control (England and Wales). Summary of programmes submitted by local authorities for the establishment of smoke control areas. Ministry of Housing and Local Government and Welsh Affairs. Cmnd. 1113. H.M.S.O., 3*s*. net.

THIS second report on local authority programmes is the result of an inquiry made to the authorities by the Ministry in January, 1962 (see *Smokeless Air*, Spring, 1962), and supersedes the report published in 1960. The information received from each authority is listed in regional tables, and the general position shows improvement over the earlier programmes, even though there are still many disappointing features.

In a Circular to local authorities on the report (No. 60/62) the Minister says he is glad to see that a number of authorities now expect to complete their programmes earlier than was originally estimated. "but there are still nearly forty authorities who expect to take another fifteen years or more". The Circular continues with more vigour than one hopes to find in an official document:

> "The Minister asks these authorities to consider whether it is really necessary for their people to put up with the beastliness of smoke pollution for so long, and whether the programmes cannot be carried through more quickly. He again asks the black area authorities who have not prepared programmes at all to consider most carefully whether this is consistent with the health and



Percentage of premises in each region (shaded) now covered by smoke control areas well-being of their communities".

The Circular points out that there is a long way to go before the black areas are substantially covered by smoke control orders. Up to the middle of 1962 less than 14 per cent of the premises in these areas had been covered; nowhere exceeding 23 per cent. "Moreover", it continues, "although some individual authorities were ahead of their programmes, the total number of premises covered by smoke control orders in the black areas was well below the total envisaged in the local authority programmes previously published. If therefore the present programmes are to be completed on time—and in the Minister's view this is the minimum to be aimed at—many authorities will have to get along more quickly than they have in the past".

The table below, from the report, summarizes the position to July 1, 1962, and the most important column is also reproduced graphically.

The Non-Starters

The report states that 54 authorities in England included in the provisional list of black areas had not, by July 1, 1962, responded to the Minister's invitation to submit programmes. This compares with 85 in the 1960 report. The 54 are listed together in the introduction to the report in what is in effect, although it is not so called, a black list. Eighteen stated that they had programmes in preparation or under consideration. Most of the others stated either that they did not consider their districts to be black areas or that they had been prevented by administrative difficulties from preparing a programme.

The list is as follows:

County Boroughs: **Darlington, South Shields.**

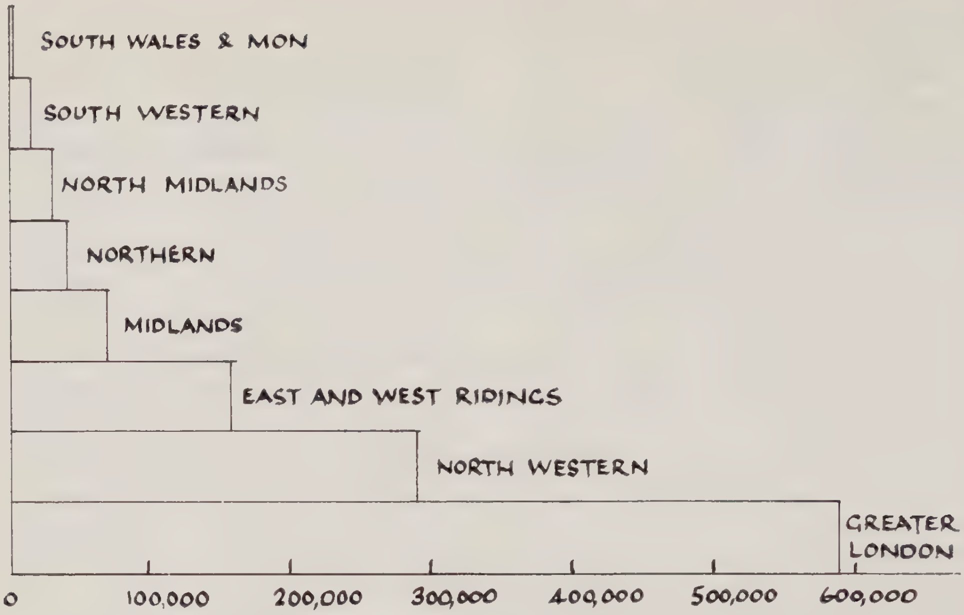
Boroughs: **Bilston, Castleford, Epsom and Ewell, Erith, Ilkeston, Rowley Regis, Surbiton, Sutton and Cheam.**

Urban Districts: **Alfreton, Arnold,**

REGIONAL SMOKE CONTROL PROGRESS

(1)	(2) *Black area acreage covered by smoke control orders confirmed or submitted for confirmation*	(3) *Percentage of total black area acreage in the region so covered*	(4) *Black area premises covered by smoke control orders confirmed or submitted for confirmation*	(5) *Percentage of total black area premises in the region so covered*
		%		%
Northern	8,616	6·9	41,682	7·5
East and West Ridings ..	42,296	11·2	157,411	13·5
North Midlands	7,819	2·9	30,733	6·0
Greater London	63,483	19·4	588,927	22·3
North Western	49,865	12·4	228,581	13·4
Midlands	13,245	5·3	71,634	6·9
South Western	3,471	13·2	14,472	9·7
Wales and Monmouthshire ..	43	0·01	651	0·2
Totals	188,838	9·0	1,134,091	13·8

The percentages shown in columns (3) and (5) above are percentages of the total acreage and of the total number of premises in the black areas concerned. In practice it may not always be necessary for a local authority in a black area to cover the whole of its district with smoke control orders; there may, for example, be stretches of undeveloped country.



Numbers of premises, by regions, included in smoke control areas

Ashton-in-Makerfield, Aspull, Barrowford, Bedworth, Blackrod, Boldon, Brierfield, Brownhills, Chislehurst and Sidcup, Conisbrough, Darfield, Darton, Dearne, Denholme, Dodworth, Eastwood, Featherstone, Felling, Golborne, Haydock, Horwich, Hoyland Nether, Hucknall, Kidsgrove, Kirkby-in-Ashfield, Lees, Longbenton, Mansfield Woodhouse, Mexborough, Normanton, Oswaldtwistle, Rawmarsh, Rishton, Ruislip-Northwood, Rothwell, Royston, Ryton, Stanley, West Bridgford, Wombwell.

Rural Districts: **Basford, Rotherham.**

The Position in Wales

The Welsh local authorities which have not submitted programmes are not so listed, because they include all of the thirty in the provisional black area, with the exception of Newport. This town has the honour of being the only one in South Wales with a smoke control area, and it aims to reach its target by 1966.

The report states that in South Wales and Monmouthshire "most of the local authorities concerned take the view that their districts are not black areas because of the relative smokelessness of much of the house coal used there, and accordingly they have not prepared programmes". The answer to this is surely that if they are already almost smokeless it would be relatively simple, perhaps after defining more closely what is meant by a smokeless fuel, for them to become smoke controlled. The whole region could become smokeless well ahead of the English areas, where the job is so much more difficult. Could not this be done, to begin with, in the County Boroughs of Cardiff, Merthyr, and Swansea?

The Target Years

The report, in the regional tables, gives the target year each authority has estimated for the completion of its programme. It will be remembered that the Beaver Committee estimated that the whole job of abolishing smoke from the urban areas could be completed in ten or fifteen years. That was in 1954.

So far only the City of London, which became smokeless before the Clean Air Act, and Holborn M.B. have completed their tasks. Quite a number of authorities, 52 in all, aim to reach their targets during the 1960s, the great majority during the 1970s, and a small group not until some time in the eighties. We think it will be useful to list the first and last of these groups for reference, the first being a kind of honours list; the second not.

Completing in the Sixties

County Boroughs: **Manchester, Newport, Wallasey.**

Metropolitan Boroughs: **Bethnal Green, Camberwell, Chelsea, Finsbury, Fulham, Hackney, Hampstead, Lewisham, Paddington, Poplar, St. Marylebone, St. Pancras, Shoreditch, Stoke Newington, Westminster, Woolwich.**

Boroughs: **Barking, Barnes, Beddington and Wallington, Bingley, Brentford and Chiswick, Dagenham, Eccles, Edmonton, Heywood, Hornsey, Mossley, Richmond, Southall, Tottenham, Walthamstow, Wanstead, Widnes, Wood Green.**

Urban Districts: **Billingham, Cheadle and Gatley, Coseley, Denton, Feltham, Friern Barnet, Great Harwood, Hayes and Harlington, Horbury, Irlam, Kirkby Knottingley, Little Lever, Padiham, Whitefield.**

Completing in the Eighties

County Boroughs: **Barnsley, Derby, Huddersfield, Stoke-on-Trent, Walsall, West Bromwich.**

Borough: **Dukinfield.**

Urban Districts: **Sutton-in-Ashfield, Leyton, Long Eaton, Mansfield, Newcastle-under-Lyne, Pudsey, Stockton-on-Tees.**

It may be remembered that in the 1960 estimates surprise was caused by the most distant date being given by Derby, 1990-2000. This has now been improved, and 1986 is given as the new target date. This is one year better than the authority now at the bottom of the table: Tynemouth.

The complete list of authorities in the black areas, showing progress to the end of 1962, will be included in the Society's *Clean Air Year Book* for 1963-4, shortly to be published.

We would like to make a request to the authorities in the "Sixties" list, above. Will they inform us when their target dates for completion are imminent, so that they may be duly given congratulatory notice in these pages?

WOMAN TO WOMAN

Editorial in *Woman*, February 2, 1963

A friend of mine moved from one London borough to another. Her new home was only ten minutes away from the old one but she tells me it might be in another world—because the new house is in one of the "smokeless zones".

Paint, clothes, furniture—even people—she says, are all cleaner and easier to keep clean. And her garden, she adds, smells of garden instead of smoke.

Well, she happens to be one of the lucky ones.

It is more than six years since the Clean Air Act was passed, yet only a tiny percentage of what has to be done has so far been achieved. Some local authorities got down to the job quickly; others—some of them faced admittedly with a very formidable job—are taking their time.

Meanwhile many of us still have to live in areas in which smoke still belches, black and threatening, from hundreds of chimneys. Not only does it make us and our homes dirty but it ruins the fabric of our buildings, pollutes the air we breathe and causes acute discomfort to people with chest complaints.

What have your local authorities done?

THE EDITOR

The smuts in the snow: familiar London suburban garden scene

The Winter Supplement

As mentioned in an editorial, the December smog coincided with the printing of our Winter, 1962, *issue, and we are therefore recording in print, as follows, the special duplicated supplement that was sent to the Press and to readers who had asked for it. Short paragraphs on the new Smoke Control Areas Report, and on the Society's forthcoming A.G.M. have been omitted.*

The printing of SMOKELESS AIR unfortunately coincided with the December smog episode, and other matters on which reports and comments would have been made.

It is much too early to attempt any useful assessment of the December smog in London and other cities or to make comparisons with the 1952 episode. Nevertheless the provisional mortality figures for the week concerned show a remarkably small increase of deaths compared with the previous week, both for London and for England and Wales. In London (Administrative County only) deaths from all causes rose by 105, compared with 1,539 in the week of the 1952 smog. Bronchitis deaths rose by 87 compared with a rise of 751 in 1952. Another significant pointer is that whereas in 1952 there were deaths and sickness among cattle at the Smithfield Show, no ill-effects at all were observed this year. Because of the number of variable factors to be taken into account, especially the meteorological, no claims can at present be made on the beneficial effects of the Clean Air Act, even though the indications are encouraging.

The publication, during the fog, of isolated measurements of smoke and sulphur dioxide concentrations, which indicated some improvement in smoke, but none, or even an increase, in sulphur dioxide, coupled with a somewhat hysterical Press treatment of such deaths as were reported, led to some hasty and ill-considered statements to the effect that the Act and smoke control areas were of little value because they did not reduce sulphur dioxide, regarded as the lethal agent. The most unfortunate conclusion was that of a *Times* leader (December 8) which was that "smokeless zones were in a sense confidence tricks".

This line of thought had in fact been opened up before the smog, in an irresponsible BBC TV "Tonight" programme (November 26) in which an anonymous physician declared that the Act was "something of a swindle", a point rubbed in by the compere, Mr. Fyfe Robertson, who described it as "largely eyewash".

The effects of such views, coming from sources regarded as responsible and reliable, were at once apparent, revealing dismay among those who are striving, often against difficulties, to implement the Act, and bringing delight to those who have been seeking to obstruct or delay it. Letters and press cuttings received indicate the harm that may have been done in shaking public confidence in clean air measures.

The argument to which we take objection is based on a failure to understand and marshal all the facts of the case. The brief answer cannot be given better than by quoting from an admirable letter by Dr. P. J. Lawther, Director of the Air Pollution Research Unit, Medical Research Council, published in the *Times* on December 15. After agreeing with the need to increase research on the removal of sulphur, he continued:

> "Current research on the clinical effects of polluted air neither exonerates smoke nor incriminates sulphur oxides but rather suggests that a combination of particulate matter and acid gases may be responsible for the irritancy of our so-called 'smogs'. But these notorious episodes are but acute manifestations of the pollution

which we suffer in lesser degree throughout the year, and in the study of the effects of this chronic pollution smoke must be regarded with grave suspicion. It is a product of inefficient combustion and contains hydrocarbons which are capable of producing cancer in experimental animals. It is also filthy.

"There would therefore seem to be every reason to strive to abolish smoke, and you could give much help and comfort to those who seek to clean the air by condemning the folly of those who, confronted with two major pollutants, would suffer both to persist because the removal of one is technically difficult".

We fully support demands for more research on the removal of sulphur gases, as urged by the Beaver Committee, and also stand by their finding that "the most serious immediate problem to be tackled is visible pollution by smoke, grit and dust."

To this it can be added that the Clean Air Act, although it is not directly concerned with sulphur dioxide control is in fact doing more to reduce low-level sulphur emissions than any other measure in being or proposed. This it does by encouraging the more efficient use of solid fuel (reducing chimney emissions), and by promoting the greater use of virtually sulphur-free gas and of electricity. There are other reasons for urgently seeking the abolition of smoke, including the obstruction of sunlight and daylight over our towns, which directly affects health, lowers resistance to infection, and prolongs fog and haze conditions.

Motives for the Clean Air Act

Comment must also be made on a further statement by the "Physician" in the Tonight programme. He stated that he thought that the Member of Parliament for Kidderminster had said one of the reasons for the Clean Air Bill was that "somebody had an awful lot of coke to get rid of". He went on to say that he thought the main interest, as far as the Government was concerned, was "to avoid any upset to industry, which the Beaver Report had shown caused at least 50 per cent. of atmospheric pollution."

What precisely is meant by these statements, or what they are meant to imply, is difficult to understand—beyond being a further attempt to belittle the Clean Air Act. To suggest that the Act was passed because "there was a lot of coke to get rid of" is ridiculous, and we are authorized by the Member for Kidderminster, Gerald D. N. Nabarro, Esq., M.P., M.Inst.F., Vice-Chairman, Conservative Parliamentary Power Committee, to say that it is grossly inaccurate to say that he has ever averred at any time that this was one of the reasons for the Act.

The need to meet a steadily increasing demand for coke and other smokeless fuels, as a result of the smoke control area programme, was a problem that concerned the Beaver Committee itself (the Report contains an Appendix on the subject) and has continued to be closely studied since then (e.g., the Peech Committee on Solid Smokeless Fuels).

The Saying of the Year?

Mr. W. F. Gerrard, F.R.I.C., of Atlantic Water Treatment Co Ltd, read a paper recently to executives of Visco Ltd, and made the following statement:

"It is not generally appreciated that, in spite of the Clean Air Act and the setting up of smokeless zones, the acidity of the atmosphere is increasing all the time; indeed those measures are actually making things worse from that particular point of view because the soot particles in black smoke absorb a large amount of acid and if you stop soot without stopping the formation of acids there is nothing to prevent them dispersing freely into the air".—*Design and Components in Engineering*, *February*, 1963.

THE REMOVAL OF SULPHUR POLLUTION

A Survey of the Problem—for Discussion

In a letter to the *Times*, during the December smog, Dr. R. Lessing cogently reviewed the need for much more intensive research on the elimination of sulphur compounds from atmospheric pollution, and asked whether some wealthy benefactor would not finance such an important investigation. The letter was a valuable reminder of the recommendation of the Beaver Committee, of which Dr. Lessing was a member. The report said, after reviewing the problem (para. 56):

> "There is thus no present prospect of substantially reducing the emission of sulphur oxide from general industry or domestic fires. This is an important issue which requires further attention and it is one of the matters which we recommend for intensive research".

Sulphur is present in coal and in its solid derivatives, and in oil. When the fuel is burned the sulphur is also burned to sulphur dioxide, some of which may oxidize further to sulphur trioxide. With moisture these gases become sulphurous acid and sulphuric acid. These acids are corrosive and there is no question that their removal is highly desirable. It is well known that the corrosive effects are increased when they are adsorbed by or associated with particulate material, as a recent American paper has emphasized (see Abstract No. 645, page 256). It is similarly probable that their harmful physiological effects are enhanced by the presence of smoke or other particles. It may well be that, epidemiologically, the consequences of sulphur pollution will be substantially reduced when smoke has been abolished, but this is no reason for failing to do all that is possible to eliminate it. It would be just as illogical to neglect the sulphur problem because there is still the smoke, as it is to dismiss the smoke because we still have the sulphur. Both must be dealt with, and at the same time we must not lose sight of the other pollutants, some of which may be more serious than we are at present aware—carbon monoxide, the oxides of nitrogen, and the metallic trace elements to which Dr. Mary Catterall has drawn attention.

What then can be done about sulphur, and what are the real difficulties in the way of its removal from the air we breathe? A brief, and therefore possibly oversimplified analysis may be useful.

There are six ways of eliminating or reducing the sulphur oxide emissions:

1. To use sulphur-free fuels and sources of power.
2. To remove, or reduce, sulphur from the fuel before it is burned.
3. To remove the sulphur oxides from the flue gases after combustion.
4. To disperse flue gases containing sulphur oxides at such a temperature and height that by the time the gases or acids reach ground level they are so attenuated as to be harmless.
5. To burn sulphur-containing fuels at maximum possible efficiency so that less fuel is required and less sulphur is emitted.
6. To regulate the quantity of sulphur-containing fuels burned in an area so that the fall-out (or immission) is kept below a determined level. This is the Maximum Allowable Concentration approach being developed in other countries.

All of these lines of action or investigation could be followed, and it is indeed desirable that this should be done. Some progress may well be made with each one, but not one alone can give a complete solution.

It would require a lengthy paper to examine each of the six points in satisfactory detail, but a few of the more important considerations may be attempted.

1. Sulphur-free sources of power include hydro and nuclear electricity, with the future possibility of power from tidal or solar energy. The potentialities of hydro generation in this country are limited, and although nuclear stations are in being or are being built they cannot for many years make a significant contribution to the general situation. Sulphur-free fuels include methane, refinery gases, and such developments as the new gas manufacture process described on another page. Normal town's gas, and the lighter oil fractions, including the popular paraffin or kerosene, are virtually sulphur-free. These fuels can make a much bigger contribution than they are doing at present.

2. Much of the inorganic sulphur in coal, associated with the mineral impurities, can be removed by washing or cleaning, although the inherent organic sulphur cannot. Much more coal than formerly is now cleaned, and the extent to which this can be further developed might be a subject for inquiry: including the removal of sulphur from coals used in the preparation of smokeless fuels. The sulphur in oil varies according to its source, and becomes concentrated in the heavier fractions. Its removal, or reduction, is feasible but is not without its technical and economic difficulties.

3. The removal of sulphur oxides from the flue gases by wet washing processes has been one of the main lines of attack for many years, but to date there are only two power stations doing this. There has been much discussion on where the balance of advantage lies, but technical opinion today generally favours dispersal, as mentioned below. For various reasons further progress with wet washing seems unlikely, and in any case it is feasible only for large installations. The dry Reinluft process, now being investigated at Warren Spring and mentioned in the House of Commons discussion on the December smog (see page 190) or some process on similar lines is a more hopeful possibility, although again it is likely to be suitable only for large installations.

4. To disperse the hot flue gases, with their sulphur oxides, through very tall chimneys, so that the gases become attenuated before they return to earth, is the policy preferred by the electricity authorities. The new generating stations, with 650 feet chimneys, are designed to achieve this. On the fall-out measurements that have been made the principle seems to be highly effective, but once more it is applicable only to such large installations. The control of chimney height in general industry and commercial buildings under the Clean Air Act is also to promote the dispersal of the sulphur oxides and other pollution, and within limits this is useful. During smog conditions, however, the average chimney is not likely to penetrate the inversion layer in the way that a very tall chimney can.

5. To reduce the amount of sulphur-containing fuel burned, by ensuring that it is used with maximum efficiency, reduces sulphur emission proportionately. This can be applied particularly to the low-level emissions from domestic houses, where the use of sulphur-containing fuel is likely for a long time to come. To replace raw coal fires at 25 per cent efficiency, by smokeless fuel burning in closed stoves at 70 per cent efficiency, reduces sulphur emissions from this source by nearly two-thirds. As this sulphur is emitted at so low a level and is concentrated in the winter months, this is perhaps the most immediately practical way available to us for reducing sulphur (not to speak of smoke), and especially if a greater use of gas, electricity and the lighter oils is also promoted.

6. It is not so much the amount of sulphur that is emitted as much as its concentration in the air we breathe that matters. The greater the concentration of fuel-burning installations in a given area, the greater will be the concentration of sulphur gases (and perhaps other pollutants) in that area. This is probably the reason for the high sulphur figures now being recorded. This is where town-planning may be at fault: overcrowded city centres, not only increasing traffic congestion, etc., but increasing the pollution that is caused by having to burn more fuel to keep more people warm in more offices. Where this is occurring—and cannot now be prevented—the SO_2 fall-out can only be checked by controlling the fuel used, and therefore when a MAC limit is reached or rather approached, the use of sulphur-free, or low-sulphur fuel or power should be made obligatory. This argument applies also to certain congested industrial areas.

Conclusion

This review, though far from complete, may suffice to show that sulphur removal is far from being a one-solution problem, and that progress may be made in a number of different ways. These include the greater use of sulphur-free fuels or sources of power, sulphur-reduced coal and smokeless fuel, removal of sulphur oxides from flue gases where applicable, very tall chimneys where applicable, higher efficiency in the domestic use of solid fuel, avoidance of too high a density of fuel use in certain areas, and control of fuel if specified MAC limits are approached.

There seems ample scope for discussion, inquiry and the formulation of a definite policy on the problems involved—a policy which would indicate the lines on which further research and development are needed.

—Arnold Marsh.

The Cleaning of St. Paul's

Removing encrustations of dirt which completely hide the intricate carving of this stone swag on a panel. Only cold water, applied by special sprays, to soften the deposits is used, followed by brushing the wet stone with special wire brushes

NORTHERN IRELAND

Clean Air Legislation Coming — Division's First Meeting

LAST year a Northern Ireland Division of the Society was established and has been followed by a welcome increase in membership. The first full meeting of the Division was held in Belfast on December 12, and was greatly heartened by a statement made the previous week by the Minister of Health and Local Government, Mr. J. W. Morgan, in the House of Commons of the Parliament of Northern Ireland. This reviews the air pollution problem in the Province so clearly that we reproduce it in full, as follows:

The Minister's Statement

Mr. Morgan said: The legislation governing smoke abatement in Northern Ireland is still the Public Health Act, 1878, which gives sanitary authorities only limited control over industrial emissions and does not deal at all with domestic smoke. Domestic sources are generally reckoned to account for at least 50 per cent of pollution from smoke, and the percentage is almost certainly higher in a community such as ours where the proportion of coal used in the domestic compared with the industrial, sector is relatively high.

I do not wish to review here the case for clean air on medical grounds, but merely to say that it would be difficult to arrive at any verdict other than "proven". The social costs arising from corrosion, damage to buildings and fabrics, loss of efficiency, etc., are considerable, and there is a sheer waste of fuel arising from poor combustion, which produces smoke.

The Government have come to the conclusion that the existing legislation is inadequate and that nothing less than a Measure with the scope and aims of the Clean Air Act, 1956, in operation in Great Britain, will suffice.

This involves, among other things, the progressively more stringent control of industrial smoke, grit, dust and fumes, and provides machinery for the virtual elimination of domestic smoke. I am aware that this statement has been awaited with some impatience. But hon. Members will appreciate that in the control of atmospheric pollution Great Britain has been far ahead of other countries in Europe, which are only now making progress in copying her example. It was right and proper that the Government here should be satisfied that a Measure as far-reaching as the 1956 Act would prove apt and workable, so that it might be in a better position to assess its suitability for Northern Ireland.

My Ministry, in consultation with the Ministry of Commerce, has considered carefully the possible effect of such a Measure on industry. Smoke emissions from plant can be remedied by improved combustion efficiency and this in turn results in savings in fuel costs. Substantial progress in this direction has already been made in Northern Ireland and there appears little reason to fear that the extension to industry as a whole of standards now voluntarily applied by a considerable section of it will on balance be to industry's disadvantage.

If this House in due course approves a clean air Measure on the lines indicated, it must be realised that we cannot expect a radical transformation overnight. This is a long-term project, aimed at a steady reduction in the concentration of pollutants in the areas worst affected. On the domestic side, progress will depend on the solution of a problem—that is, the availability of suitable fuel—to which it is not yet possible to see a complete answer. Continuing research is going on in Great Britain into the development of smokeless fuels, which one hopes would over a period help to solve any problems of availability, or

At the Northern Ireland Meeting: William Combey, of Oxford (left); Councillor Miss Irene McAlery, Divisional Chairman; and W. E. C. O'Brien, Hon. Secretary

indeed price, which might be expected to arise.

Under present circumstances, reliance in Great Britain has been placed mainly on coke, though householders are, of course, free to choose any fuel which complies with the requirements of the Act. It would seem that in Northern Ireland, too, an important element in the implementing of the domestic programme—so far as solid fuel is concerned—could therefore be the availability of more abundant local supplies of coke of appropriate quality and price. Belfast Corporation faces the biggest task in the control of air pollution but it is also a producer of fuels, including coke, which are vitally important in the furtherance of smoke prevention. I hope that what I have indicated regarding the Government's intentions will encourage the Corporation to consider how far it can devise fuel policies which will also give the maximum impetus to a clean air programme. While drawing particular attention to this aspect of fuel supplies I do not, of course, lose sight of the fact that all fuels which can be burned smokelessly will have a contribution to make, and it is hoped that this statement will be helpful to those concerned in the provision of all these fuels.

My Department will shortly be circulating to local authority associations, the Northern Ireland division of the National Society for Clean Air and other interested bodies a memorandum which will form a basis for consultation on proposals for legislation. I cordially invite all bodies who wish to express views on this subject to get in touch with my Department at an early date, so that all possible progress may be made with the preparation of the legislation.

The Divisional Meeting

The meeting on December 12 was held in the City Hall, Belfast, with the Rt. Hon. the Lord Mayor of Belfast, Alderman K. Wallance J.P. in the Chair. Over a hundred people were present representing Government departments, Local Authorities, the Northern Ireland Hospital Authority, Northern Ireland Housing Trust, other public bodies, industrial undertakings, and individual members.

The first speaker was Councillor Miss Irene M. E. McAlery, J.P., Chairman of the Division, who described the work and aims of the Society in Northern Ireland. Then followed a paper on "Air Pollution and Health" by Professor John Pemberton, of Queen's University, Belfast; and then a paper entitled "Out of the Fire", by William Combey, Chief Public Health Inspector, City of Oxford, and Chairman of the Society's South-East

Divisional Council.

In the course of his address Professor Pemberton said that the Belfast City Health Department and the Department of Social and Preventive Medicine, Queen's University, recognized that an air pollution problem existed in Belfast and since 1958 they had been taking daily smoke and gaseous acid readings in a number of points in the central and suburban areas. More recently, daily measurements of air pollution had been taken by local authorities at Ballymena, Castlereagh, Londonderry, Lurgan and Newry, and the pattern of air pollution in Northern Ireland was becoming clearer.

During the six winter months (January-March and October-December, 1961) the mean smoke value in the central area of Belfast was 28 mgm/100 cubic metres. This was lower than smoke levels in industrial cities in the north of England but about the same as Greater London, taken as a whole. The concentrations of smoke in the suburbs of Belfast, and in the provincial towns, during the same period were about 65 per cent and 40 to 60 per cent respectively of the figures obtained in central Belfast. Mortality rates from bronchitis were substantially higher in Belfast than in the suburban towns and rural areas. This relationship between bronchitis and urbanization was also evident within the city of Belfast, where the bronchitis death rate (1961) in men aged 45-64 years was more than twice as high in the central areas than in the suburbs.

Mr. Combey's paper was comprehensive and dealt with both the evils of air pollution and the progress that was being made towards its removal. He surveyed in some detail the Clean Air Act, 1956, and its operation over the last few years. He commended the concept of smoke control areas and made a plea for their rapid extension.

Finally, the meeting passed the following resolution:

"That this meeting welcomes the Statement made last week by the Minister of Health and Local Government in the House of Commons indicating the Government's intention to introduce Clean Air legislation in Northern Ireland. The meeting congratulates the Government on the decision which has been taken and would hope that it will be given early implementation."

Display at Saltburn. N. R. Darling, C.P.H.I., explains points about clean air at a shop window exhibition on the premises of a member of the Saltburn U.D.C., Councillor A. King. Many of the exhibits were on loan from the Society

QUESTIONS IN PARLIAMENT

SMOKE FROM VEHICLES

Mr. E. L. Mallalieu asked the Minister of Transport what further steps he has taken to ensure that smoke is not emitted from vehicles on the public highway; if he is satisfied with the present position; and if he will make a statement.

Mr. Marples: I have nothing to add to the reply given to my hon. Friend, the Member for Bristol, North-East (Mr. Hopkins) on November 28.

Mr. Mallalieu: But is not the Minister aware that almost every time we undertake a long journey we still see this black smoke being emitted? (HON. MEMBERS: "Hear, hear.") Even if it is impossible to police all the miles of roads, is there not some other way in which action could be taken? There might be voluntary reports to chief constables, six such reports perhaps leading to prosecution—or something like that.

Mr. Marples: This is a difficult problem, not because the will is not there but because it is scientifically difficult to invent a device to measure the smoke emitted, and so secure a successful prosecution in the courts. We have had very great difficulty. We have gone to court, and the lawyers—as the House will be surprised to know—have argued at length about it, and there have been very few successful prosecutions. The difficulty is to get a device that will scientifically measure the smoke emitted, but in my original reply I have said that, pending such a device being invented, a Regulation has been put into operation. Special spot road checks are being held this year, and the measures taken are having good results. The difficulty is that a spot road check catches a number of drivers in the first half hour, after which there is a system of signalling from those drivers to other drivers which means that we do not catch as many in the succeeding half hour.

Mr. D. Smith: Can my right hon. Friend say whether there has been an increase in prosecutions since the Regulations were made?

Mr. Marples: I could not say that without notice, but I know that we observed 83,000 lorries. Of those, 9,800 were emitting black smoke; 6,200 were stopped, of which 132 were taken out of service immediately. There were 3,900 vehicles threatened with prohibition from carrying goods unless they later satisfied a second test. In addition, 4,000 warning letters were sent. I agree that it is not a lot but it is the best we can do without a measuring device. I only hope that we can get a measuring device and then there will not be lack of enforcement.

(*December* 5, 1962)

SMOKELESS FUELS IN SCOTLAND

Mr. Hannan asked the Minister of Power if he is satisfied that the supply of smokeless fuel in Scotland is sufficient to meet the increasing demand consequent on the increase of designated smokeless zones; how much of this fuel is produced by the National Coal Board in Scotland; and how much is imported from England.

The Parliamentary Secretary to the Ministry of Power (Mr. John Peyton): Yes; none. About 27,000 tons a year.

Mr. Hannan asked the Minister of Power if he is aware that the Gas Boards have refused to supply the demands of the Scottish Coal Merchants' Association for smokeless fuel in bulk, and that there has been consequent delay at supply points; and if he will make enquiries into this matter and take steps to improve the situation.

Mr. Peyton: The Scottish Gas Board in marketing Gloco, an open-fire gas coke, has preferred to sell it in bags to ensure reliable quality. The Board will consider sales in bulk to merchants who can maintain quality through their own storage and bagging facilities. At the same time supplies in bags are being increased to meet merchants' needs more quickly.

(*December* 10, 1962)

SMOKELESS FUEL PRODUCTION

Mr. Cooper asked the Minister of Power what is the estimated annual production of smokeless fuels; and what steps are being taken to increase this.

Mr. Peyton: About 1·6 million tons of the specially reactive fuels and at least 5 millions ton of other cokes suitable for open fires. Total capacity is in excess of demand. So far as premium fuels are concerned a substantial increase in the production of Coalite and Rexco is planned and the National Coal Board hopes to be producing smokeless briquettes for the open fire on a commercial scale by early 1964.

(*December* 10, 1962)

SMOKELESS FUELS

Mr. Darling asked the Minister of Power whether he will consult the National Coal Board, the Gas Council and the Coal Merchants Federation with a view to improving the distribution of smokeless solid fuels, so that householders in industrial areas such as Sheffield can obtain adequate supplies of suitable solid fuels that will keep their homes warm and also meet their obligations under the Clean Air Act.

Mr. Peyton: Heavy sales before the ending of summer prices caused some shortages of premium fuels in Sheffield and elsewhere. Supplies of Cleanglow are improving and there is no shortage of Gloco, which is cheaper and will burn satisfactorily in a modern grate. I do regularly consult these bodies all of which are represented on the National Advisory Committee on Smokeless Fuels of which I am Chairman.

Mr. Longden asked the Minister of Power whether he has yet received any advice from the Domestic Coal Consumers' Council on how to deal with the excessive moisture content in smokeless fuels.

Mr. Peyton: No, Sir, but I expect to receive a report from the Council shortly.

(*December* 10, 1962)

LOTS ROAD POWER STATION

Dr. Stross asked the Minister of Housing and Local Government and Minister for Welsh Affairs what consultations he has had with the London Transport Board regarding the effect on atmospheric pollution of their proposed conversion of the Lots Road Power Station from coal to oil burning; and at what height the chimney gases will be discharged into the atmosphere.

Mr. Corfield: The Alkali Inspectorate have been in consultation with the London Transport Executive. The change will eliminate grit emissions and should reduce smoke. All chimney gases will be discharged through existing 275 ft. chimneys; the four 162 ft. chimneys will become redundant.

Dr. Stross: Does not the Parliamentary Secretary agree with me that although there will be less smoke and no grit following this change there will be very much more sulphur dioxide? Is not this most undesirable? Would it not be far better if this installation was not used at all and the main source of electricity supply came from the Electricity Board? If it is argued that in that case there is no guarantee of failure against the ventilation of the Underground, does he not agree that this could easily and cheaply be achieved by installing secondhand jet aero engines using kerosene which have no sulphur in them at all?

Mr. Corfield: In reply to the first part of the supplementary question, I am assured that the ground level concentration of sulphur dioxide in the power station will be reduced, and, it is hoped, reduced substantially. With regard to the future and alternative methods of working on the Underground, I think that this is a little beyond my competence, but I will certainly go into that with my right hon. Friend the Minister of Transport.

(*January* 29, 1963)

FUEL OIL

Mr. Fitch asked the Minister of Housing and Local Government and Minister for Welsh Affairs if he will amend the Clean Air Act to restrict the use of fuel oils to those of lighter viscosity.

Mr. Corfield: No, Sir. The supply of lighter viscosity fuel oil falls far short of the total oil requirement of industry.

Mr. Fitch: Is the hon. Gentleman aware that the heavier fuel oils emit far more sulphur dioxide into the atmosphere than lighter ones? In the interests of cleaner air, will he reconsider that decision?

Mr. Corfield: I appreciate the truth of what the hon. Gentleman says, but about four-fifths of the fuel oil burnt in industry is of high viscosity. If that were banned there would be not nearly enough of low viscosity oil to meet requirements.

Mr. Fletcher: Does the hon. Gentleman realize that the London smog in December, which had such fatal consequences, was due to the emission of sulphur dioxide? Is he doing nothing to prevent a recurrence of this condition in the London area?

Mr. Corfield: As I think I have already told the hon. Gentleman, research is progressing. So far there is no real evidence that sulphur, without the combination of smoke, is dangerous to health. We are pressing on with our clean air procedure to limit the smoke.

(*February* 5, 1963)

GRANTS FOR CLOSED STOVES

Mr. J. Hynd asked the Minister of Housing and Local Government and Minister for Welsh Affairs whether he is aware that the present maximum grants permitted for conversion to smokeless grates are still insufficient to enable conversion to the more expensive closed stoves capable of burning the cheaper fuels; and, in view of the shortage of premium fuels suitable for open grates, if he will authorize an increase in the grants for closed stoves suitable for consuming the more plentiful cheaper fuels.

Mr. Corfield: Where stoves are installed, grant under the Clean Air Act is normally based on the notional cost of open fires designed for burning smokeless fuel. In areas where supplies of smokeless fuels suitable for open fires are likely to be inadequate, my right hon. Friend is prepared to consider relating the grant to the actual cost of stoves, but he must take into account the availability of suitable gas cokes as well as the availability of premium fuels.

Mr. Hynd: While thanking the hon. Gentleman for that reply and the information which I am sure will be welcomed in many smokeless zones, will he ensure that some examination is made of the position in Sheffield, particularly, where there is a serious shortage of these fuels and where there has been difficulty in getting adequate grants to enable closed fires to be installed.

Mr. Corfield: I understand that my right hon. Friend the Minister of Power is considering the position in a number of areas other than the North-East where this applies at the moment.

(*February* 5, 1962)

SMOKE CONTROL ORDERS

Mr. Wade asked the Minister of Housing and Local Government and Minister for Welsh Affairs whether in his consultations with the Minister of Power before confirming further smoke control orders, he ascertains whether smokeless fuel supplies are not only available but also suitable for the particular local conditions.

Mr. Corfield: My right hon. Friend consults his right hon. Friend the Minister of Power on the basis of the local authority's estimate of fuel requirements in the prospective smoke control area.

Mr. Wade: Does the Minister agree that if the clean air policy is to succeed it is important that the hardship and distress caused by the change-over should be minimized as far as possible? Is he aware that many protests have been made in my constituency, particularly by elderly people, about the timing of the order and the cost and suitability of the fuel available? Is he satisfied that there is adequate consultation between his Ministry, the Ministry of Health and Ministry of Power before an order is confirmed?

Mr. Corfield: Yes, Sir. I assure the hon. Gentleman that no smoke control order is confirmed unless my right hon. Friend the Minister of Power advises that adequate supplies of the necessary fuels are available.

Mr. Hocking: Will the hon. Gentleman give an undertaking that there will not be an extension of smokeless zones until there has been a vast increase in the amount of premium smokeless fuels available?

Mr. Corfield: I do not think that I can give that undertaking. The undertaking I can give is that every smoke control order will be considered in the light of the availability of fuels in the particular area.

(*February* 5, 1962)

SMOKE CONTROL AREAS—COLD WEATHER DIFFICULTIES

Mr. Charles A. Howell asked the Minister of Housing and Local Government and Minister for Welsh Affairs in view of the shortage of smokeless fuel, what advice he is giving to local authorities regarding the possible breach of smokeless zone regulations by householders compelled to use other types of fuel causing smoke.

Mr. Corfield: Authorities which raise the matter are being advised to consider refraining from prosecution where distribution difficulties due to the cold weather make it temporarily impossible for people to get solid smokeless fuel. Authorities can apply to my right hon. Friend for the suspension of smoke control orders if they think this necessary.

(*February* 15, 1963)

Sahara Gas Goes North

Sir Henry Jones, Chairman of the Gas Council, with Mr. D. P. Welman, Chairman of the North-West Gas Board, inspecting a section of the 300-*mile pipeline that will take Sahara gas from the Canvey Island terminal to the north and other parts of the country*

INTERNATIONAL SECTION

U.S.A. NATIONAL CONFERENCE

1,000 *meet in Washington*

THE National Conference on Air Pollution held in the Sheraton Park Hotel, Washington, D.C. from December 10 to 12 could best be described as gargantuan—but it was much more; a reflection of the nation's acceptance of Clean Air as Federal policy and an opportunity for experts from all walks of life to emphasize the complexity of the problem within a highly-urbanized society.

The Conference was convened by the U.S. Department of Health, Education and Welfare Public Health Service and in his welcoming address Mr. Anthony J. Celebrezze prefaced his remarks with a reference to the London smog episode being a crippler and killer of as yet uncounted number of people in Great Britain. As Mayor of a large American city (Cleveland) he saw the problems of urban environment as more frequently subtle than obvious and made reference to the slow and steady adulteration by pollutant gases and smoke of the air we breathe, so hidden that for days on end, when wind and weather were right, we may not even be aware of it.

Local Government, he went on, needed enough financial and technical assistance to allow the full recognition and appraisal of long range problems. When citizens were properly informed they were willing to pay for control measures so less costly than the dollar damages from polluted air.

During his opening address, Mr. Celebrezze explained how Federal training and educational efforts had helped to develop needed technical skills as well as a better understanding of the problem. A Bill that had now been presented to Congress placed emphasis on the responsibility of State and local governments for regulatory actions but assisted them in meeting their responsibilities. He envisaged cities more beautiful than had ever been seen before in history but they would be inconceivable without a constant supply of fresh, clear and healthful air.

Another speech of welcome was given by Dr. Luther L. Terry, the Surgeon-General of the Public Health Service who pointed out that there were no signs on the horizon to suggest that man's capacity for fouling his nest had lessened. He referred to the ever-increasing proliferation of scientific knowledge that enabled men to breathe in the air-less void beyond the earth's atmosphere and yet permitted the quality of the air we breathe on the surface of the earth to continue to deteriorate. Air pollution was costing the United States 7,000 million dollars each year and yet only half of the urban population was served by local control programmes with full-time staff. Dr. Terry maintained that since modern man could determine the nature of his environment he must learn to accept responsibility for its deficiencies in much the same way as he accepted responsibility for his individual acts. Deaths from chronic diseases associated with environmental factors which occurred daily were crimes. Who was to blame? Where were the culprits? What should we do to apprehend them? Where? Everywhere. We were all guilty, we were all responsible. Let's get on with it, he said. Let's clear the air!

The Conference then proceeded

and there followed plenary sessions and panel discussions on all aspects of the problems of air pollution. Altogether 63 experts presented papers, giving the viewpoints of captains of industry, senators, departmental executives, medical specialists, meteorologists, the Campus and the Law. The case was presented for political statesmanship, scientific statesmanship and industrial statesmanship in air pollution control and an air pollution control officer from Los Angeles submitted the case for the reasonable approach as a response.

Vehicle pollution was dealt with most thoroughly. Seven papers and subsequent discussion drew attention to the role and effects of pollutants emitted, methods and programme of control and, perhaps most important of all, the impact on the motoring public. Dr. L. Chambers of Los Angeles pleaded for further research on what happens to pollutants in the atmosphere. Many impressive statistics were marshalled but the estimate of crop damage in the eastern part of the United States at $18,000,000 mostly from ozone, emphasized the possible menace of uncontrolled emission from vehicles.

Vehicle maintenance and inspection, exhaust control devices and the use of licensed inspection stations were commended but the Chairman's summing up concluded with a reference to the complexity of the problem and the grounds for hope in the broad public impact taking place.

The Health Aspects

Six papers covered many varying aspects of "Industrial pollution, the Power Plant and the Municipality" and during a somewhat lengthier session on Health Considerations, Dr. W. S. Spicer of the Maryland University School of Medicine gave a detailed account of the increased vulnerability of those who lived in "black areas" to lung complaints. His research district was one where the average yearly suspended particulate from measuring stations was 130 microgrammes per cubic metre. Another speaker, Mr. John R. Goldsmith from the California Department of Public Health referred to the impressive relationship between morbidity and mortality rates from chronic bronchitis and air pollution on the one hand and mortality from lung cancer and air pollution on the other in Great Britain. In the United States, however, the evidence was not so clear cut.

"Agricultural, Natural Resources and Economic Considerations" were dealt with next and Dr. John T. Middleton of the University of California delivered a trenchant paper on the destruction of national resources since earliest times. Smoke had marked wall-paintings in the south of France before recorded history and the Greek geographer Strabo described the irritating and offensive odour of the dye pits in the city of Tyre before the birth of Christ. In the Middle Ages it was recorded that smoke from the burning of fuel caused the sooting of property and the reduction of visibility in many European cities.

Dr. Glenn R. Hilst of Connecticut introduced the very lengthy session on "Applying our Measuring and Monitoring Know How" by offering a paraphrase of the Biblical injunction for practical brotherly love, "Cast thy wastes into the atmosphere and they will probably show up in unexpected places and in unexpected forms"—to this could be added parenthetically "And cause unexpected results".

Then followed the presentation of 14 papers and a reference by Mr. M. D. Thomas of California to the unknown feature of the London smog—the role played by sulphuric acid aerosol produced by the oxidation of sulphur dioxide. He concluded with the statement of Dr. Rossano, "In man's never-ending quest for a better and safer environment constant vigilance to protect our most vital air resources is both a necessity and a responsibility".

James Dixon, President of Antioch College, Yellow Springs, Ohio, chaired the final session devoted to "Applying our Public Information and Sociological Know How". He warned the Conference that the present discharge into the atmosphere of the physical by-products of twentieth century knowledge offered more prospect of death and unacceptable alteration of life than the prospect of a continuous process of creative human evolution. Our hope was that ways would be suggested which would circumvent the barriers obstructing action and that the fields of communication, sociology and political science would offer new resources in the evolution of a more successful strategy in the three-cornered struggle between man, his systems and his environment.

Dr. Luther L. Terry in his concluding remarks at the end of the Conference paid tribute to its scope which had provided a much larger field of knowledge than could conceivably have been brought together by other means. Although the filters in air sampling devices were still coming out grey or black he was not discouraged for they had reached agreement on a fundamental principle: that it is every man's right to breathe air that is not a hazard to his health or property and that this right must take precedence over a great number of lesser rights.

REPORT FROM NEW ZEALAND

From R. T. Douglas, Chief Chemicals Inspector, Department of Health

As an essentially farming country of low population density New Zealand would not be expected to have any serious air pollution problems. In fact the degree of pollution is yet insignificant on world standards but sufficient has already been experienced to point to the need for control measures designed to limit the growth of pollution. A country such as this produces a very large amount of waste organic matter which either finds its way into the river systems or must be destroyed by methods which involve the risk of air pollution. Another rather unusual problem is the growth of urban populations on geothermally active areas such as Rotorua, Taupo and Kawarau. Quite vast quantities of carbon dioxide and hydrogen sulphide in lethal concentrations are discharged into the atmosphere through steam vents and the ground itself. There have been numerous fatalities mainly so far in excavations and poorly ventilated building spaces such as bathhouses and on one occasion in a toilet. It seems possible that the risk to the public at large is increasing as the result of the construction of multi-storeyed reinforced concrete buildings and the sealing of roadways as the flow of gases is not stopped but simply diverted to smaller areas. In the South Island where climatic conditions closer to those of England are experienced the classic form of reducing smog is quite well developed. So far there has been no evidence of the oxidizing type of smog associated with good climate and motor vehicles although as might be expected street level pollution can be as high as anywhere else. In fact the New Zealand Friday night shopping habit and a ratio of motor vehicles to population second only to North America presents an excellent opportunity for the development of this type of problem.

The population density on a total area basis is small but the mountainous character of the country and a reproduction rate among the highest in the world is rapidly creating areas of high density housing. There is consequently no room for complacency. It would indeed be an excellent thing if an organization such as the National Society for Clean Air could be established in New Zealand. Perhaps fortunately the practical experience of some measure of air pollution in Auckland and in Christchurch has to some extent already roused popular feeling but it needs continuing stimulation.

In Auckland during the period 1950 to 1960 localized but quite severe hydrogen sulphide pollution was experienced and led to the introduction of some air pollution control legislation duplicating the British Alkali Act. The source of the air pollution was gross contamination of tidal mud flats with organic wastes primarily from meat processing works. Sewage treatment has eliminated this particular problem. The meteorological conditions which were a necessary complementary factor remain. This is a matter for serious consideration in a city which should reach the million population in the quite forseeable future. The air pollution situation is therefore being kept under continuing surveillance by the Auckland Air Pollution Research Committee, an organization supported by a voluntary levy of 1½d/head of local authority population.

The other area of recognized significant air pollution is the city of Christchurch. A survey of air pollution has been in progress there for the past three years and should publish its report early next year with recommendations for control measures. The indications are that the pollution experienced is primarily from domestic fires. It can, therefore, only be regarded as a most retrograde step, that to meet the immediate difficulties of the nationalized coal industry a traditional tar briquetting plant is being established. However, this is but one illustration of how difficult it is to avoid repeating the mistakes of the past. A smokeless fuel plant desirable as it would be just cannot be justified on economic grounds. Planning on a scale adequate for a population two or three times as large as at present would greatly increase the cost of current development. Under the shadow of E.E.C. expediency is likely to win most of the battles with enlightened foresight. Nevertheless the forefathers of the present settlers often did build with just such a concern and pride for the future under what must have been much more difficult circumstances. In at least one city it was a joke for many years that the trams, now defunct, should have run across instead of up and down the streets!

The air pollution situation in New Zealand is, therefore, one of considerable interest and opportunity. Even in the field of research we have I think a chance to contribute to world experience. The work of Dr. D. Eastcott is a good example of type of work we could be doing. He found the usual correlation between urban population and cancer of the lung but more important that settlers coming to this country from the more heavily polluted atmosphere of England showed a higher incidence rate than the born New Zealanders. There is the opportunity here to follow the development and effects of particular forms of pollution in an unusual degree of isolation. I would be most interested in any suggestions for such research. In my own work I am trying to follow the lead of the British Alkali Inspectors but broadening the field of interest to cover all aspects of air pollution control.

Italy

FAMOUS PINES OF ROME AFFLICTED BY POLLUTION

Roman pines are suffering from a strange malady. The first symptoms were noticed in March 1959 when the foliage of many trees began to turn brown. Not all the branches were affected and the phenomenon occurred only in certain parts of the city. Later the trees produced new vegetation and in most cases recovered. By 1962, however, many plants which had turned brown in previous years had lost a lot of their vitality and were doomed to die.

The Commune of Rome called in a Commission of experts who undertook a thorough analysis of numerous samples of pine branches taken from different areas and of branches in varying stages of dryness. In July the Commission announced its findings—namely, that one of the most important causes was the accumulation on the leaves of carbonaceous materials, residue of incompleted combustion of liquid hydrocarbons and from the action of corrosive gases of varying origin. This accumulation is more conspicuous on the domestic pine than on other species due to its peculiar sensibility to attack by chemical agents.

Professor Biraghi, of the Institute of Forestry Pathology, declared that sulphur dioxide, from the sulphur that is present in certain fuel oils, is the main pollutant. Pines are extremely sensitive to the corrosive quality of this gas. Professor Biraghi suggested the prohibition, in central heating plants, of fuel oil containing more than a specified amount of sulphur and recommended a periodical control of the burners to ensure that the combustion of fuel is as complete as possible.

This winter precautions have been taken in all areas where the greatest number of pines have been affected in the past—areas containing the largest number of central heating plants. Some branches have been covered with plastic bags, others manured, others treated with a solution of petroleum oils. But the main hope expressed by Dr. Ricci, Chief of the Rome Commune Gardens Service, is the use of a filter in the central heating plants. Just how effective the treatment is will be seen when the heating is turned off after the winter heating season.—*Jill Tyler.*

The First Mile Up

Canadian A.P. Film

One of Canada's most densely populated areas is on the same line of latitude as parts of California. Here an urbanized district confronted air pollution problems as serious as those experienced in Los Angeles and solved them by international action. This joint U.S.-Canadian project at Windsor, Ontario, is one of the many aspects of the country's concern for clean air described in "The First Mile Up", a new production of the National Film Board of Canada.

There are effective sequences of the 1952 London Smog and also of the fatal "incident" in Donora, Pennsylvania, when half the town's population was rendered sick by low level pollution. The vigorous efforts for Clean Air in Toronto are shown and the alerting of a smoke inspector by radio communication suggests that evasion by recalcitrant householders or flat-caretakers is quickly detected.

One senses a vigour and enthusiasm as other preventative methods are explained by city and provincial experts and, reminding us of a newer menace, the Nobel prizewinner, Dr. Linus Pauling, warns of the ever-present threat from nuclear fall-out pollution.

The film presents much evidence of the dangers of air pollution and there are many vivid impressions of smoke menace. In proffering the experience of cities in North America who are trying to overcome the problem of air pollution it fills a gap in the existing collection of films on Clean Air.

At present only one print is available in this country but efforts are being made to effect a more general distribution. The film runs for 28 minutes and is 16 mm. black and white. Loan requests should be addressed to National Film Board of Canada, 1 Grosvenor Square, London, W.1.

SMOKE CONTROL AREAS

Progress Report

POSITION TO JANUARY 1, 1963—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation Acres, 3,400 Premises, 41,060	44	1
Smoke Control Areas in Operation . . . . Acres, 177,965 Premises, 988,661	889	30
Smoke Control Orders—		
Confirmed	237	6
Submitted	133	3
Grand Totals	1,303	40

The list given below are supplementary to the information in the last issue of SMOKELESS AIR (Winter, 1962) which gives the position up to October 1,1962. They now show the changes and additions to January 1, 1963.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Areas in Operation

Aireborough U.D. No. 10, Atherton U.D. No. 1, Barking B. Nos. 2 and 3, Barnes B. No. 3, Bethnal Green M.B. No. 3, Bingley U.D. No. 3, Birmingham C.B. Nos. 53 to 62, Blaby R.D. No. 1, Bromley B. No. 4, Camberwell M.B. No. 3, Chatham B. No. 1, Cheadle and Gatley U.D. Nos. 2 and 4, Chelsea M.B. No. 2, Chesterfield B. No. 3, Chingford B. No. 2, Dagenham B. No. 3, Dartford B. No. 3, Ealing B. Nos. 8 and 9, Enfield B. No. 3, Failsworth U.D. No. 2, Gateshead C.B. No. 14, Gillingham B. No. 1, Hackney M.B. No. 4, Halesowen B. Nos. 5 to 12, Hammersmith M.B. No. 3, Hampstead B. No. 4, Harrow B. No. 3, Hemel Hempstead B. Nos. 1 and 2, Holborn M.B. Nos. 5 and 6, Hornchurch U.D. No. 4, Hornsey B. No. 4, Huddersfield C.B. Nos. 3 and 4, Islington M.B. Nos. 7 and 8, Lambeth M.B. Nos. 4 and 5, Lewisham M.B. No. 11, Morley B. No. 10, Newcastle-upon-Tyne C.B. No. 5, Nottingham C.B. No. 2, Nuneaton B. No. 6, Oldham C.B. No. 4, Ossett B. No. 2, Padiham U.D. No. 2, Poplar M.B. No. 14, *Prestwich B. No. 4, Rochester B. No. 1, Sheffield C.B. Nos. 8 and 9, Shipley U.D. No. 2, Slough B. No. 3, Southwark M.B. No. 2, Staines U.D. No. 2, *Thurrock U.D. No. 1, Tottenham B. No. 3, Warrington C.B. No. 5, Watford B. Nos. 1 and 2, Wednesfield U.D. No. 4, Westminster M.B. No. 9, Wigan C.B. No. 2, Wilmslow U.D. Nos. 6 and 8, Woolwich

M.B. No. 12, Yiewsley and West Drayton U.D. No. 4.

Addendum: In Operation on August 1, 1962: Wrexham B.

New Orders Confirmed but not yet in Operation

Aldridge U.D. Nos. 6, 14 to 16, Barnet U.D. No. 4, Battersea M.B. No. 3, *Bebington B. No. 8, Bingley U.D. Nos. 4 to 6, *Birmingham C.B. Nos. 63 to 80, Blackburn C.B. No. 3, Blaydon U.D. No. 2, *Bolsover U.D. No. 1, Brentwood U.D. No. 3, Burnley C.B. No. 3, Carshalton U.D. No. 3, Cheadle & Gatley U.D. No. 5, Chesterfield B. No. 4, Colne B. No. 2, Dartford B. No. 4, Darwen B. No. 1, Denton U.D. No. 6, Deptford B. Nos. 4 and 4A, *Derby C.B. No. 3, Droylsden U.D. No. 8, Dudley C.B. No. 5, Edmonton B. No. 5, Feltham U.D. No. 3, Finchley B. No. 7, Gravesend B. No. 1, Greenwich M.B. Nos. 4 and 5, *Halifax C.B. No. 6, Hayes & Harlington U.D. No. 20, Hemel Hempstead B. No. 3, Hendon B. No. 5, Heston & Isleworth B. No. 6, High Wycombe B. No. 11, Huyton-with-Roby U.D. No. 3, Ilford B. No. 3, Islington M.B. Nos. 9 and 10, Keighley B. No. 2, Kensington M.B. No. 6, Kingston-upon-Thames B. No. 3, Kirkby U.D. No. 3, Leeds C.B. No. 23, Leicester C.B. Nos. 8 and 9, Lewisham M.B. Nos. 12 and 13, Manchester C.B. No. 6, Middlesbrough C.B. No. 3, Morley B. Nos. 19 and 20, *Newcastle-under-Lyme B. No. 2, Newcastle-upon-Tyne C.B. No. 7, Northfleet U.D. No. 2, Nuneaton B. No. 7, Ossett B. No. 4, Preston C.B. No. 7, Prestwich B. No. 6, Richmond (Surrey) B. No. 4, Rotherham C.B. No. 11, St. Marylebone M.B. No. 6, St. Pancras M.B. No. 5, Sheffield C.B. No. 10, Stalybridge B. No. 6, Thurrock U.D. No. 2, Todmorden B. No. 2, Twickenham B. No. 3, Wakefield C.B. No. 6, Wallasey C.B. Nos. 8 and 9, Walthamstow B. No. 5, Wanstead & Woodford B. No. 4, Wembley B. No. 6, West Bromwich C.B. Nos. 10 and 11, Widnes B. No. 2, Wilmslow U.D. No. 11, Wimbledon B. No. 2, Woolwich M.B. No. 15, Worsley U.D. No. 1.

New Orders Submitted for Confirmation but not yet Confirmed

Acton B. Nos. 6 and 7, Aireborough U.D. Nos. 12 and 13, Aldridge U.D. No. 17, Aylesbury B. No. 1, Barking B. No. 4, Beckenham B. No. 2, Bethnal Green M.B. Nos. 4 and 5, Bexley B. No. 1, Billingham U.D. No. 2, Birmingham C.B. Nos. 34, 81 to 88, Blaby R.D. No. 2, Bootle C.B. No. 5, Brierley Hill U.D. Nos. 12 to 14, Brighouse B. No. 8, Bristol C.B. No. 6, Camberwell B. Nos. 4 and 5, Chadderton U.D. No. 5, Coventry C.B. No. 4, Crawley U.D. No. 4, Dagenham B. No. 5, Dukinfield B. Nos. 4 and 5, Ealing B. No. 13, East Barnet U.D. No. 4, Eccles B. No. 5, Enfield B. No. 4, Finchley B. No. 8, Finsbury, M.B. No. 4, Friern Barnet U.D. No. 3, Fulham M.B. No. 7, Grantham B. No. 7, Hackney M.B. No. 6, Halesowen B. No. 18, Hampstead B. No. 5, Harlow U.D. No. 3, Harrow B. No. 5, Hendon B. No. 6, Hornchurch U.D. No. 5, Huddersfield C.B. No. 6, Ilford B. No. 4, Keighley B. No. 3, Kingston-upon-Hull C.B. No. 10, Lambeth M.B. No. 6, Manchester C.B. No. 7, Mold U.D. No. 1, (Wales) Newcastle-upon-Tyne C.B. No. 8, Nuneaton B. No. 8, Oldham C.B. No. 5, Ossett B. No. 5, Paddington M.B. No. 4, Padiham U.D. No. 6, *Preston C.B. No. 6, Rotherwell U.D. Nos. 1 and 2, Royton U.D. No. 3, Seisdon R.D. No. 1, Shoreditch M.B. No. 5, Skipton U.D. No. 1, Southall B. No. 5, Stanley U.D. No. 1, (Durham), Stepney M.B. No. 4, Stockport C.B. No. 4, Stoke-on-Trent C.B. No. 11, Tottenham B. No. 4, Warrington C.B. No. 6, Wembley B. No. 8, Wigan C.B. No. 3, Willenhall U.D. No. 15, Winsford U.D. Nos. 4 to 7, Wood Green B. No. 5, Woolwich M.B. Nos. 16 to 18.

SCOTLAND

New Smoke Control Orders in Operation

Clydebank No. 2 (Mountblow), *Edinburgh (Sighthill No. 3), Falkirk Nos. 1 and 2, Kilmarnock No. 1, Stirling County (Stenhousemuir No. 1).

New Smoke Control Orders Confirmed but not yet in Operation

Dumbarton Burgh Nos. 3 and 4.

Cut in Rates

Seven householders in Chestnut Avenue, Farnham, successfully appealed to the Southern Valuation Panel in Guildford against the proposed assessment of their properties. They complained of alleged nuisance from the chimney of an oil-fired boiler at the Farnham Dairy's depot close to their homes. The assessments in each case were reduced by between £3 and £4 in the rateable value.

Storing Electricity

The Ffestiniog Scheme

The recent cold spell emphasized the importance of being able to supply electricity at peak periods without excessive expenditure on reserve generating stations. The Ffestiniog Scheme, in North Wales, demonstrates an important way in which this may be done. The description is extracted, with the photographs, from a brochure published by the Central Electricity Generating Board.

THE Ffestiniog pumped storage scheme is really a means of storing electricity. With its artificial reservoirs, its tunnels through rock, and its water turbines, the plant may resemble a conventional hydro-electric station. But the part it plays in the strategy of electricity generation is much more like that of a giantic electric storage battery.

The chief inspiration of the scheme is the dramatic variation of the nation's demand for electricity from one time of day to another. Typically, the demand for electric power in the small hours of the morning may only be a third of the demand during the peak daylight hours, at the beginning and the end of the working day. The result is that there is plenty of surplus generating capacity during the night. By contrast, during the peak hours of a winter day a high proportion of the nation's generating equipment has to be pressed into service to meet the swollen demand for electricity.

The power station and reservoir at Tan-y-Grisau, showing the pipelines coming down from the Stwlan Dam

The generating plant normally left unused during the small hours of the morning includes some which is much more efficient and economical than that needed to meet the peak demand during the day. The cost of using it to produce electricity is comparatively small. So might it not be possible to put some of this efficient plant into service in the small hours, and to store up the electricity against the peak hours in the daytime, when demand is greatest?

This is precisely what is accomplished by the Ffestiniog scheme. During the night electricity produced cheaply at economical power stations throughout the country is used to pump water up the mountainside above Ffestiniog, from a lower reservoir to a higher one. What happens is that the surplus electrical energy is converted into mechanical potential energy. This is much the same as the way in which the energy needed to run old grandfather clocks is stored as the potential energy of heavy weights hanging from cog wheels.

At Ffestiniog there are means of turning this stored energy back again into electricity. This is done by letting water run back from the upper to the lower reservoir and—by means of the water turbines—using its energy to drive electrical generators. Something approaching three-quarters of the energy needed to pump water up the mountainside will be recovered when the process is reversed.

The system at Ffestiniog is, in fact, capable of storing the equivalent of about 1·2 million kilowatt-hours of electricity. To do this with commercially available electrical storage batteries would be impracticable and uneconomical. Something like one million tons of storage batteries would be needed. The amount of lead needed to make them would compare with the world's annual production of this material.

This comparison over-dramatizes the virtues of pumped storage, however. Nobody in his right senses would dream of storing electricity in bulk if only storage batteries could be used for the purpose. And the economic justification of the Ffestiniog scheme must be based on a comparison of the cost of the conventional generating plant that would otherwise have to be built so as to satisfy the peak demands for electricity.

By this test the value of the Ffestiniog scheme to the nation's electrical economy lies in the 300,000 kW of electricity it will be able to supply during peak hours.

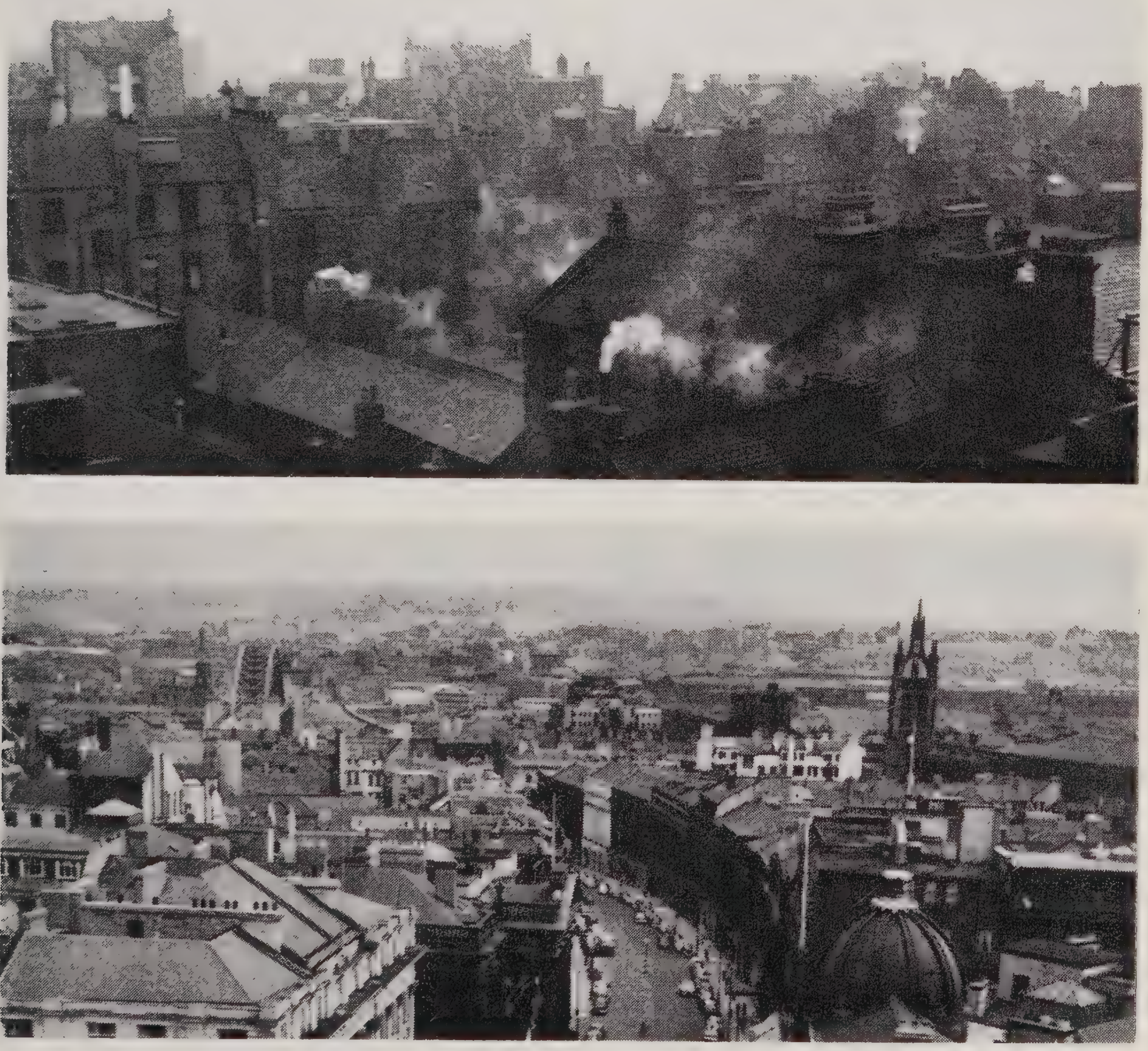
Because pumped storage plant is expected to be much more continuously available for service than conventional power stations, and because the

The Stwlan Dam, 1,000 *feet above the power station, during construction*

Ffestiniog station—unlike a straightforward coal-fired station—will use only a negligible amount of power on and about the station itself, it has been calculated that the 300,000 kW at Ffestiniog will do the work of 360,000 kW of generating capacity installed at conventional types of power stations. Another advantage is the rapidity with which the station can be put into action in case of an emergency.

When the balance sheet was struck in 1955, calculations showed that the scheme should lead to an economy of something like £200,000 a year in its first full year of operation, with the savings increasing year by year throughout its life. This, combined with the saving on construction cost compared to the cost of equivalent coal-fired plant is a substantial financial advantage. It is however, only proper to record that the balance sheet is now less favourable to the development of further pumped storage scheme because the cost of conventional generating plant has fallen during the past seven years by 30 per cent.

The C.E.G.B. brochure continues by giving much more information about the construction, working and functions of this most interesting development.



Newcastle-upon-Tyne: The top photograph shows a typical view over the city, and the lower one across the central smokeless area

CHEAPER GAS BY NEW PROCESS

The Gas Recycle Hydrogenator Process

The prospects for gas, which have so considerably brightened over the last couple of years, are now further improved by the development at the Gas Council Midlands Research Station at Solihull of a revolutionary new gas production process, the Gas Recycle Hydrogenator.

The discovery of this process, a new application of hydrogasification, by a team of scientists working under Dr. F. J. Dent, O.B.E., Director of the Research Station, means that an important round has been won in the gas industry's constant battle to achieve for itself the widest possible freedom of action in the choice of raw materials for gas making. Over the past decade, as the traditional method of gas production by coal carbonization has become increasingly uneconomic, largely as a result of the declining market for coke, the industry's research effort has concentrated on the total gasification of both coal and oil feedstocks.

Several oil gasification plants, making use of a wide range of feedstocks, have been brought into operation since the first commercial-scale unit of the Segas process was commissioned in 1953. Last year the first coal gasification plant in Britain using the Lurgi process was brought into operation by the Scottish Gas Board at Westfield, near Fife, and a second Lurgi plant is now in course of construction at Coleshill, near Birmingham.

Because of the trend towards more centralized production, and also to facilitate the elimination of carbon monoxide from town gas, the industry has turned increasingly to the use of production processes which operate at high pressure. However, all the high pressure gasification processes hitherto in use, both coal and oil, make lean gases which require enrichment to reach the calorific value of town gas. As there is as yet no commercial method for the manufacture of the enrichment component from coal, the use of petroleum products for enrichment purposes has been essential.

Hitherto these enrichments have been limited mainly to refinery gases and liquefied petroleum gases, such as Butane and Propane. The significance of the discovery at Solihull is that the gas industry is no longer dependent on these external sources of enrichment. Thanks to the Gas Recycle Hydrogenator, Gas Boards can now make rich gas themselves and are freed from the necessity of buying it.

Use of Light Distillate

The process developed at Solihull uses light distillate, which is at present readily available and can be operated in conjunction with any source of lean gas (mainly hydrogen). The essence of the new process is that it relies on an internal recycle of the reacting gases to control the reaction. In the gas recycle hydrogenator distillate is heated and mixed with the lean gas, resulting in a rich gas of high calorific value comparable to that of Butane and refinery gas. This rich gas is then blended with more lean gas to produce town gas.

Output of the hydrogenator is very high; in the experimental plant at Solihull 0.9 million cu. ft. a day was produced from a reactor of only 1 ft. diameter. The outstanding merit of the process is its simplicity, which, of course, affects both the operating and capital costs. The cost per therm of town gas produced by the recycle hydrogenator is sufficiently attractive to ensure the success of the new process.

By the middle of next year a new and important source of enrichment for lean gas will have arrived on the scene when the importation of methane from North Africa is due to begin.

For geographical reasons, however, not all Area Boards will at first participate in the methane scheme, and it is for these Boards that the new process is particularly attractive.

The South Western Board, one of those which will not be receiving methane, has ordered, from the Power-Gas Corporation Ltd, the first gas recycle hydrogenator to be operated in this country. A new gasworks is to be built, subject to planning permission, on land leased from the Port of Bristol Authority at Avonmouth. The lean gas for the hydrogenator will be produced by a steam reforming process for light distillate developed by I.C.I. The plant will incorporate stages for carbon monoxide conversion carbon dioxide removal, and gas drying.

Sulphur-free, non-toxic Gas

All the distillate will be pre-treated to remove sulphur, so that the final town gas will be sulphur-free and virtually non-toxic. The present contract is for two units, each to produce 10 million cu. ft. a day of town gas, with ample provision on the site for future expansion. The plant will occupy only one-ninth of the space, and be built at one-eighth of the capital cost of a coal carbonization gasworks with the same production capacity. Not least of the advantages of the new process is that Gas Boards who adopt it will need to find storage for only one feedstock.

Another contractor, Humphreys & Glasgow Ltd, has received an order from Germany for a plant at Hanover for the Demag Aktiengesellschaft Refinery. The enrichment gas will be provided by the Gas Recycle Hydrogenator under licence from the Gas Council. The contract was obtained in the face of German and American competition. Plant capacity at over 25 million cu. ft. a day of town gas will be rather higher than that of the plant at Avonmouth.

The successful development of gas recycle hydrogenation is not only another string to the gas industry's bow and an advance in the economics of gas production, it is also a story of major scientific interest.

Undertaken as part of the work on the hydrogenation of oils, which has been in progress at the Council's Midlands Research Station for a number of years, the experiments on light distillate achieved this breakthrough last February. Within less than a year a commercial plant to operate the new process, which is, of course, protected by patents, has been commissioned. The development of the new process was in fact the result of an ingenious short-cut taken by Dr. Dent and his team at Solihull.

They found a means by which distillate can be hydrogenated without the deposition of carbon, and hence without the need of a fluidized bed of coke to accept it. The control of the reaction, which is highly exothermic, is achieved as a result of the rapid circulation of the contents of the vessel whereby they absorb reaction heat in being brought rapidly to the working temperature. This greatly simplified the design of the reactor, which is much less elaborate than that required for the hydrogenation of heavier oils.

Pilot plant tests carried out at the Research Station during 1962 were so promising that a design study was commissioned by the Council in August. The results of this study were obtained in September and were highly favourable, and the first commercial plant in this country has now been ordered.

Such, to date, has been the brief and highly encouraging history of a discovery which is expected to make a major contribution to the economics of gas production both in Britain and in many other countries.

In New Zealand a boiler operator must be certificated and notices advertising a vacancy always emphasize this fact.

Normal earnings for such a post average between £18–£20 per week.

THE RUSSIAN APPROACH TO AIR POLLUTION

A Paper by Dr. Riazanov

AN important contribution to the Society's International Conference in London in 1959 was that from Professor A. V. Riazanov, Chairman of the Medical Committee on Air Pollution of the U.S.S.R. State Medical Commission. He described the investigations and techniques that had made possible the establishment of maximum allowable concentrations for pollutants in the air, and listed thirty pollutants for which determinations had been made.

Of particular interest was the description of the methods by which the permitted concentrations were obtained. This work has been further described and brought up-to-date in a paper by Dr. Riazanov entitled "Sensory Physiology as Basis for Air Quality Standards", read at the fifth California Air Pollution Medical Research Conference, Los Angeles, December 6, 1961. The paper is published in full, with the discussion, in *Archives of Environmental Health* (November 5, 1962), published by the American Medical Association.

In his paper the author describes in some detail the methods used in the laboratories of his Institute. First, there is the measurement of the olfactory awareness of a pollutant. Groups of volunteers are used in odour perception tests. Then, and used more widely in Russian research, is the method known as optical chronaxy. This depends on the fact when a weak electric current is applied to the eyeball there is, at a certain level of stimulation, the sensation of a flash of light. The degree of stimulation required to give this reflex effect is changed under the influence of inhalation of a gas or aromatic substance, varying with its concentration. The effect is due to the excitation of one area of the cerebral cortex causing inhibition in other areas. Thus it is possible to measure the concentration of a pollutant at which a physiological reaction occurs.

This method, however, is found to be insufficiently sensitive, and a further technique, called the adaptometer method, was developed. This depends on the fact that the sensitivity of the eye to light, or adaptation to darkness, varies from the previously ascertained normal for the subject, if pollutants are introduced into the clean air previously breathed. Very low concentrations are needed to cause this effect, far below the toxic limit. Again measurements may be made of the threshold for change in light sensitivity—a manifestation of reflex physiological reaction—induced by various substances.

Dr. Riazanov discussed a further, and more advantageous method that has been developed and which he described in brief in his paper to the London conference in 1959. This is the method of electrocortical conditioned reflex. In outline, the biocurrents that occur in the cerebral cortex, and which are a manifestation of nervous activity, can be measured and recorded. They show a definite rhythm, known as the alpha-rhythm. This rhythmic wave-form is disturbed or desynchronized by light, and the way in which this occurs is modified by very weak concentrations of odours, and after some repetitions of the procedure the desynchronization may be set up by the gas or odour alone, which thus becomes the conditioning stimulus. The threshold at which this effect occurs can then be determined.

A more recent development is based

on another cerebral response: the wave pattern of a encephalogram tends to follow the frequency of light impulses that are being flashed on the subject in a definite rhythm—each person has his own optimal rhythm which it is easiest for him to assimilate. It was shown that if during this process a substance capable of affecting the olfactory receptors is inhaled there is an interference with the imposed oscillation rhythm. The first difference is a decrease in the time it takes to retain an imposed rhythm. Secondly, if the intensity of the light, under normal conditions, is increased, there is an increase in the amplitude of the imposed biocurrent, but in the presence of a pollutant (phenol is referred to) this effect does not take place.

In the course of his paper Dr. Riazanov explained the reasons for this form of research and evaluation of maximum allowable concentrations:

"We support the point of view that the ambient air should not contain odours to be imposed on a population against its wishes. The human being uses the olfactory excitation, for instance, perfume, in those cases when he desires to do so. He does not want to stand for breathing air containing any aromatic substances present there against his wishes. Therefore, inhabitants always object strongly to the pollution of the ambient air by extraneous aromatic substances which are discharged by industry, for instance. We must recognize the right of human beings to breathe the type of air which they like. This can be achieved when the air of our cities becomes free of extraneous odours. These ideas are the compelling reasons for our study of the threshold of odours from various atmospheric pollutants".

The Discussion

The paper, of which the above is only a precis, is of considerable scientific interest, as is the new list of pollutants to which M.A.C. values have been given. The question that arises with the Western reader is of course to what extent are these rigorous standards used in practice in the U.S.S.R.? Dr. Riazanov was questioned about this in the discussion that followed the paper, and his reply (abridged here) is illuminating:

"The standards in our country", he said, "are used somewhat differently than in your country. We understand that it is not possible to reach very rapidly the levels suggested by the use of these very low standards. . . . These standards are for the purpose of use in the future, not today. They cannot be reached today, yet. We consider that the standards we have developed must serve as the goal for our industry to reach.

"If our standards, as we developed them, corresponded to the standards that could be practically used at this moment—today—now—if this were the case, there would be no need for studying the methods of bringing about better cleanliness and prevention of atmospheric pollution, and the industry would not have to be under tremendous pressure from the scientific community to bring about reduction of atmospheric pollution. Hygienic standards must also be ahead of present technical developments, otherwise they would be applying a brake to our progress. . . . As scientists and as physicians, we cannot consider whether these standards are practical. We simply must state what the requirements for a clean atmosphere are, and in this way force our technology to seek methods of improving and coming near those standards we seek. . . ."

"But I do not mean today that our standards are truly unrealistic. Even now, we have been able to reach some of them in our country, but it requires a good deal of action to reach this point. For instance, to bring down the standards for sulphur dioxide to the standards established, it is necessary to change the method and type of the fuel used in cities the size of Moscow; that is, to use illuminating gas for supplying heat instead of coal that is still being used. We consider that by 1965, Moscow will be completely on this illuminating gas as fuel instead of coal".

Administration

In reply to a question on the administration of air pollution control —whether there was an engineering commission working towards standards for emissions to meet the ambient air standards discussed, Dr. Riazanov said:

"The Commission contains physicians, engineers, physicists, chemists, and a number of other specialists that we have set. In our country, the right to prescribe to industry regarding the standards they are to meet lies with the Ministry of Health. This is brought about through the help of the sanitary-epidemiological stations which are like local health departments. These stations in the various industrial towns have engineers on their staffs. These engineers help the physicians in our stations to bring about the necessary regulations which the industry must meet. The laboratories of these stations produce systematic analyses of the samples of air, and in this manner they determine which enterprise might be contributing to the pollution of the air in the area. These figures and findings are the bases on which the rules are made by the chief, who is a physician in charge of the sanitary-epidemiological stations in that particular area. But in this case, there is a great deal of help given to the physician by directing their work through whatever organ of local government is responsible for the industry. If the data of the sanitary-epidemiological stations are sufficiently convincing, the government allows the industry involved the necessary monies and so on to produce the necessary changes. I regret to say that the laboratories in our sanitary-epidemiological stations are not as well equipped as some of the laboratories I have seen in this city, and we will try very hard to reach the same level of laboratory equipment as you have".

SMOKE CONTROL IN SALFORD

Salford Health Committee have published an excellent booklet for distribution to householders in areas to be smoke controlled. Based largely on material given in Ministry of Housing and Local Government circulars, the 20-page booklet, which was first printed in *The Medical Officer*, consists of a series of 35 questions, to which clear and factual answers are given, of the kind that are likely—or certain—to be asked. For the most part they are concerned with the replacement of appliances and grants, but they also cover the burning of coke, the problem of garden rubbish in a control area, the cost of smokeless fuel, and the question of lighting fires. The booklet has on the front cover a zoned map of Salford carrying the slogan "All Salford by 1967".

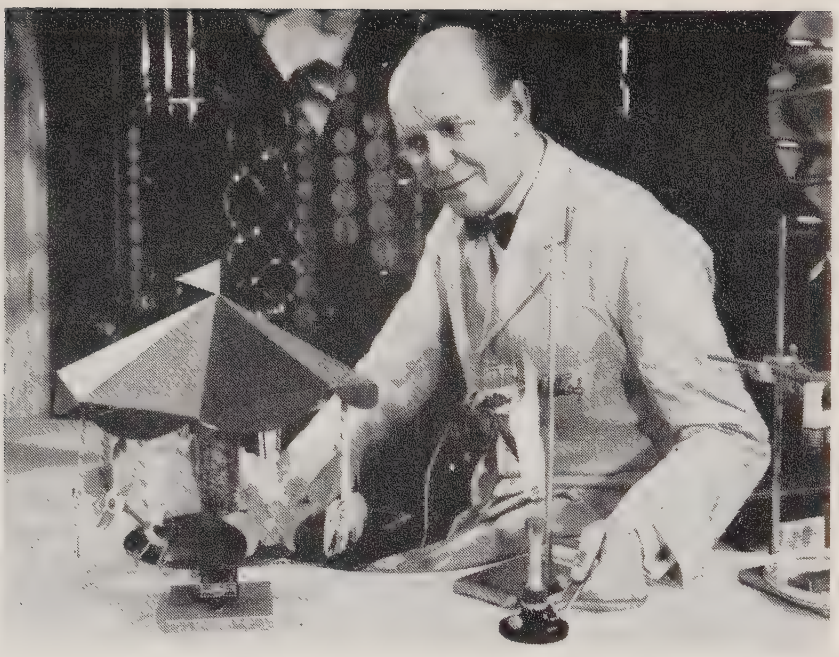
We understand that the *Medical Officer* would be able to provide similar booklets for other authorities with, of course, a different cover.

The Scottish Development Department has issued to local authorities concerned a typescript model for a similar booklet, not for distribution to the public but "principally as a guide for local authorities who may wish themselves to produce explanatory booklets for householders in smoke control areas". Many of the questions and answers are the same as Salfords, but minor differences have crept in. The Scottish version says a smoke control area is one "established by a local authority in which smoke must not be discharged from chimneys", etc. Salford's definition is an area "mapped out by the Council in which smoke must not be seen coming from the chimneys".

Productivity Conference

Four hundred prominent industrialists and trade union leaders were guests at the Electrical Development Association's "Electricity for Productivity" conference in London on November 29. It was one of the first major events of National Productivity Year and also marked the anniversary of E.D.A's 1952 productivity conference.

David Nixon in
"What's in a Flame"



New Gas Council Films

Three new films of the Gas Council's usual high standard were recently screened, and although they do not on this occasion bear directly on clean air, they will be well worth noting by readers concerned with programmes for film shows. The first, "What's in a Flame" will absorb any audience interested in simple, or not so simple, science. It describes the story of Fire, its myths and legends, and its origin, and then David Nixon, acting as a kind of scientist-conjuror, does some fascinating things (in his fascinating way) with gas flames. Our photograph shows him driving a model roundabout with a flame as the motive power, and he also demonstrates a gas-powered radio. Top marks for instructive entertainment.

The next film, "The Four Seasons" is a pleasingly told story of the four seasons of the year, with some, usually unobtrusive, build-up for gas in the home. The third film is quite different, and should appeal very much to any audience of women or senior school girls. It will appeal also to the new breed of husbands whose passion it is to improve their homes. "Room for Improvement" is a convincing, continuously interesting, and technically first-class film on how badly planned kitchens can be converted to kitchens that are modern, convenient and pleasant to work (or eat) in. Actual examples of conversions, aided by some excellent acting and spiced with humour, are shown. The film was produced in co-operation with the Council of Scientific Management in the Home. Can be seen with advantage by all but those who neither work in the kitchen nor have any interest in what is produced there.

All the films are in colour. The first two mentioned have 20 minutes running time each; the third has 22 minutes. More information can be obtained from the Films Officer, Gas Council, Murdoch House, Grosvenor Place, London, S.W.1.

Prolonged Pecking

In a thoughtful and helpful article on the air pollution problem in the *Yorkshire Post*, Dr. Mary Catterall (who is to give a paper at the Society's conference in October) drew attention to the possible significance of the "trace elements" present in urban atmospheres and urged they be given more attention and research. The article concluded:

"The problem of air pollution is one of national urgency of the gravest importance. It must be treated as such and the present prolonged pecking at the problem must stop".

Some New Publications

Fuel Economy, 1963. An annual review devoted to fuel efficiency. pp. 148. Federation of British Industries. 10s.

This annual publication maintains the interest and practical value of its contents and seems to go one better each year in the stylishness of its production. Of the eleven articles in this number of particular interest to many of our own readers will be those on fuel efficiency and productivity, by S. C. Ginn of N.I.F.E.S; on the development of domestic and industrial solid fuel burning appliances by Dr. Alan Taylor of the N.C.B., on the uses of hard coke in industry, by H. H. Prosser of the B.C.I.A., on metal melting by electricity by W. Robinson of E.D.A., and on the underground storage of gas, by D. Scott Wilson of the Gas Council.

The article by Dr. Taylor—who is to give a paper at the Scarborough Conference of the N.S.C.A. in October—is of particular importance as it is concerned mainly with the N.C.B.'s immediate programme for the development of domestic and small industrial appliances used for heating and steam raising.

Health Officials Guide to Air Pollution Control. pp. 52 (duplicated typescript, 4to), American Public Health Association, Inc., 1790 Broadway, New York 19, N.Y. (not priced).

This guide is a handbook or short, text-book, prepared by a committee of the Association. It is practical, not too detailed or too technical, and will be of interest to British workers even though U.S. legislation and administration is so different from our own. There is a chapter on the evaluation of the effects of air pollution, then one on the role of the local health department, and an appraisal of the task; followed by sections on estimating emissions and on detecting and measuring them. Finally apart from a series of appendices and tables etc., are chapters on legislation and its administration, and on "Community Relations", in which is stressed the importance of education and of "securing the voluntary co-operation of all persons who may contribute to air pollution or are interested in its control."

Electric Space Heating—Design and Practice by J. J. Barton, M.I.H.V.E., M.Inst. F.A.I.E.E. Published by George Newnes Ltd. 200 pp. 50s.

Electricity plays an important role in the promotion of cleaner air and this book will be of immense value in assessing the advantages of electric space heating.

The first chapter details two classifications of electric space heaters and systems—(1) equipment using electricity at the standard tariff, including radiant fires, convectors, unit heaters, reflectors, radiant panels, oil-filled radiators, tubular heaters and circulators, (2) underfloor heating (embedded and withdrawal systems), block storage heaters and thermal storage systems, all of which are allowed to use electricity during restricted hours at a special low rate. The permitted hours of usage coincide with the off-peak generating periods, when the power stations are operating below capacity.

The author deals next with the correct choice of electric heating to suit a particular building and goes on to explain heat losses from buildings, with detailed tables on temperature and air change rates, heat transmittance coefficients, typical values for downward heat loss from heated ground floors or solid concrete on dry sites at different room air temperatures and examples of heat loss calculations.

Sixty-eight pages are devoted to examples in design of direct systems and these are followed by chapters on the application of the electric circulator to low pressure hot water space heating, the design of a single dropping pipe system, the two-pipe gravity system and forced and accelerated systems.

Estimating for Heating & Ventilating by J. J. Barton, M.I.H.V.E., M.Inst.F., A.I.E.E. George Newnes Ltd. pp. 216. 42s.

The author is a heating and ventilating consultant and he has set out in this book to help those engaged in the industry and the building trade generally. The first chapter gives some general observations on the principles and elements to be considered when preparing estimates. Then follow sections on specifications and drawings, materials, labour requirements, the preparation of tenders, costings, builder's work and annual running costs.

Typical standard specifications are given for (*a*) Heating and general clauses, (*b*) Ventilation, (*c*) Automatic Underfeed Bituminous coal stokers and (*c*) Electrical work associated with the heating and ventilation installation.

In the section on Automatic Underfeed Bituminous Coal Stokers, the stoker maker is reminded that he must give a certificate or other written assurance that the machine has been designed to burn bituminous coal at the firing rate stated in the maker's catalogue without causing smoke. He must also guarantee in writing that the machine satisfies in every way the requirements of the Clean Air Act and regulations current at the time of tendering.

Worth While

The National Society for Clean Air has rightly hit back at those who have been suggesting that, since there was a lot of sulphur dioxide in the recent London fog, the Clean Air Act is really a sham and a waste of time.

If the Clean Air Act does nothing more than clean soot and grit out of the atmosphere it will have been worth while.—*Northern Echo.*

A new book to be published March 21st . . .

ELECTRIC SPACE HEATING

Design and Practice

by J. J. BARTON
M.I.H.V.E., M.Inst.F., A.I.E.E.
(Heating & Ventilating Consultant)

An invaluable new book for the building, heating and electrical installation industries. Its wide coverage includes the different types of electric space heating systems available – choosing the system – calculating heat losses from buildings – examples in design and direct systems – application of the electric circulator to low pressure hot water space heating – design of single dropping pipe system – two pipe gravity system – forced and accelerated system. **A considerable portion of the work is devoted to ELECTRIC FLOOR WARMING.**

206 pages with half-tone and line illustrations, scheme sheets, tabular matter and mathematical calculations plus 12 pages of Conversion Tables.

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(Complete technical book list available on request)

NEWNES

CONTRIBUTIONS TO CLEANER AIR

Technical and Commercial News

Rotary Ashbox Fire

The first large estate to incorporate the Baxi fire with special rotary ashbox, which allows continuous burning, is being built at Wokingham, Berkshire by Letts Bros., 340 Richmond Road, East Twickenham, Middlesex who are agents for True Bond Homes. The estate will also have the Baxi-Pak small bore central heating system installed.

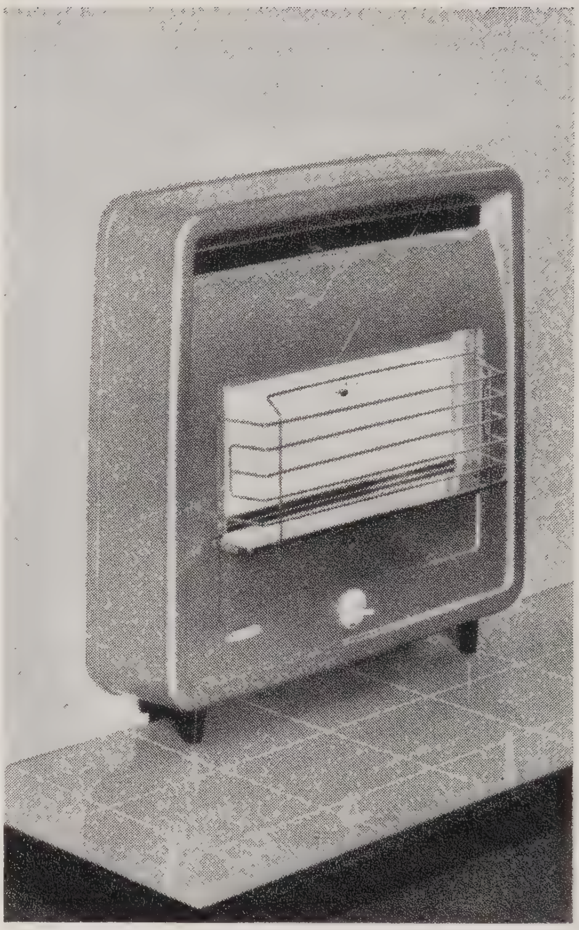
The Baxi Rotary Ashbox model has the ashbox in two sections. By lifting off the cover plate set in the hearth and rotating the ashbox, the full section can be lifted out after the empty section is in position, while the fire continues to burn.

There will be 173 bungalows, chalet-bungalows or houses on the estate, ranging from 800 to 1,250 sq. ft. floor area, with two to four bedrooms. The central heating installation for each building will consist of an 18 in. Baxi fire with rotary ashbox and back boiler to supply domestic hot water, five radiators and towel rail.

Rexco Expansion

The National Carbonising Company is extending its main Rexco smokeless fuel plant at Edwinstowe, Notts, by a further seven retorts. This will bring the total output of this plant and that at Mansfield to nearly 300,000 tons per year. The company is also negotiating for the building of a Rexco plant at Comrie Colliery, near Oakley, Dunfermline.

New Low-Cost Gas Room Heater



The Bratt-Colbran "Ten" Gas Fire

We welcome the announcement of a new gas room heater that will appeal to many people in new smoke control areas who may be deterred from converting to gas because of the cost of one of the new and very popular room heaters. Bratt-Colbran, Ltd., one of the Radiation Group of Companies, who pioneered the "new look" with their Walmer fire in 1959, and followed through in 1962 with the technically advanced glass-fronted Crystalglow (reviewed in this journal Autumn, 1962, p. 31) have now applied modern design to a much cheaper gas fire.

This of course gives heat by both radiation and convection, and with a nominal rating of 16,000 Btu. per hour, will provide full heating for the average living room. The price is only £11 3s. 10d., plus present purchase tax of £2 3s. 8d.

Though perhaps simplified in some respects (e.g., a built-in battery operated igniter is an extra), the fire has two very useful features. The legs can be adjusted to give a variation in height according to the fireplace opening, or the legs can be discarded and the Bratt Colbran "Ten" can be mounted on the wall.

Sulphur Recovery Plant

A contract for a sulphur recovery plant to be built at the Westfield, Fife, works of the Scottish Gas Board has been won by a member company of Simon Engineering Ltd., Simon-Carves Ltd.

The plant will form part of a Lurgi gasification installation at Westfield and will recover sulphur from a Benfield hot potassium carbonate unit, at the same time reducing air pollution by eliminating sulphur dioxide.

Based on the well-established Claus process, modifications will be made in the design to enable the plant to cope with the Low H_2S strength in the feed gas. An existing waste gas disposal unit which was also built by Simon-Carves will be incorporated into the sulphur recovery plant.

The value of the order is £100,000 and Simon-Carves will not only carry out design work but will also provide all construction materials, supervise erection and commission the project.

Mod. Cons. for Tower

The Tower of London is switching to modern techniques for heating. A battery of Ekco Thermovent convectors has been ordered for background heating in the famous Jewel House.

High Speed Gas

The Gas Council is producing a nation-wide series of prestige publications featuring the latest domestic appliances for gas. Distribution will be free through the 12 Area Boards of a first print order of 250,000 of each brochure. Space heating, cooking and water heating will be featured.

We have received the first of these brochures, illustrating ten of the new high-efficiency space heaters, and a handsome, colourful publication it is.

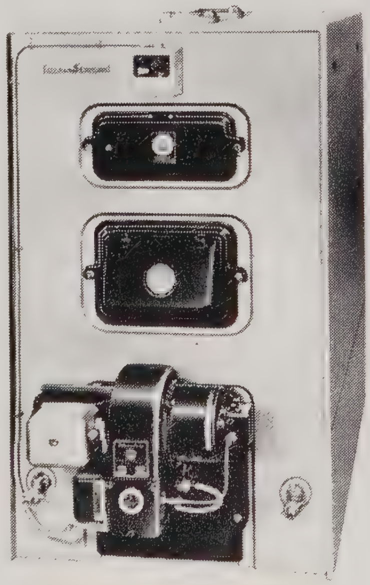
Sunbrite

The British Coking Industry Association (74 Grosvenor Street, London, W.1.) have recently revised and reprinted their various leaflets dealing with domestic heating with Sunbrite. The two we have received are well-produced, factual folders giving useful information about the appliances for which Sunbrite is suitable, including both closed stoves and boilers for central heating. Also available from the Association is a more detailed and technical Information Sheet No. 1, on domestic central heating with Sunbrite.

New Oil-Fired Boiler

A new "Ideal Vanguard" series of oil-fired boilers for industry have been introduced by Ideal-Standard Ltd. They are available in seven sizes, ranging from 175,000 to 385,000 B.t.u./hr., and are supplied as a matched boiler/burner unit.

An important advantage of this boiler is that the air/fuel ratio is pre-



The Ideal-Vanguard Oil-fired Boiler

set to give acceptable performance, the very minimum of site adjustment being required on initial commissioning to obtain optimum CO_2 and smoke values.

Special features include air, fuel and draught controls. The combustion of air control of each burner is pre-set at the works to give the correct air delivery according to the size of the boiler with which the burner is supplied. A graduated scale allows the setting to be readily checked on site.

The oil nozzle is selected and fitted at the works and pump pressure is pre-set to give the correct oil delivery according to the size of the boiler with which the burner is supplied.

The Rootes Tempair Air Conditioner

Portable Air Conditioner

An entirely new portable air-conditioning unit—the first of its kind in the world to offer real air-conditioning—has recently been put on the market by the Rootes Tempair company. Only half the size of an average TV set and completely self-contained, the new unit marks a new concept of personal air conditioning.

Plugged into an electric supply, the unit can filter, cool (or warm) dehumidify and wash the air, and direct it unobtrusively to create a zone of fresher, cleaner air around the user up to nine feet away. Weighing only 42 lb. it can be carried from room to room in one hand and it costs nothing to install.

The unit, the P.A., is priced at £59 12s. 7d., or with a two kW heater, £66 7s. 9d. Running cost for the cooler unit is only 3d. for an 8 hour day.

Sirocco Success

Davidson & Co. Ltd., Sirocco Engineering Works, Belfast, inform us that they are to receive a £350,000 contract for the supply of equipment to Coolkeeragh Power Station, Londonderry, Northern Ireland. The contract covers six regenerative air preheaters of the type for which Davidson's were recently awarded a £1,250,000 contract by the C.E.G.B. and also includes forced draught fans and flue dust collectors for three new boilers which are being added to the Londonderry station.

NCB SMOKELESS FUEL PRODUCTION

Moves towards the construction of a full-scale smokeless fuel plant at Coventry Colliery, Keresley, have recently been taken a few steps forward, said a National Coal Board correspondent to a *Coventry Evening Telegraph* correspondent (Jan. 31).

Outline planning permission had been received and preliminary site investigation had been carried out, but it was not possible to give a date for the start of construction. It was hoped that work would start some time this year and, if the plan ran to schedule, the production of smokeless fuel should start before the end of 1965. The ultimate output potential would be in the region of 650,000 tons a year.

As an interim measure it was intended to scale-up production at the Birch Coppice pilot plant to a rate of 50,000 tons a year in time for next winter.

Power Exhibition

The Central Electricity Generating Board, responsible for the largest integrated electricity supply system in the world, is presenting an exhibition at the headquarters of the Royal Institute of British Architects in March, 1963, to show the nature of the amenity problems resulting from the construction of new power stations and transmission lines required to meet the ever increasing demand for electricity.

NEW REDFYRE AUTOCOKE 40 BOILER

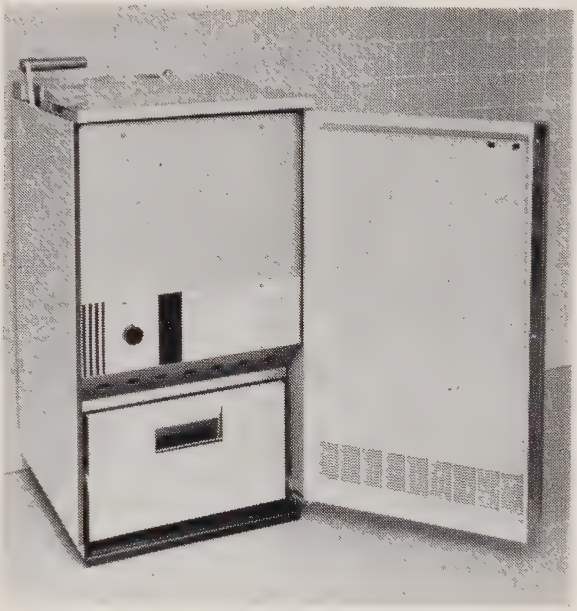
The first medium-priced electrically controlled hopper-fed domestic boiler designed to burn coke automatically and efficiently has just been introduced by Newton Chambers & Co. Ltd., of Thorncliffe, Sheffield. This new Redfyre Autocoke 40, with a heating rating of 40,000 Btu's per hour, requires the minimum of attention. It incorporates an electro-thermostat which controls a fan and solenoid damper unit. This automatically provides air for combustion through the ashpit and enables the boiler to operate efficiently under all conditions. It was developed by Newton Chambers in association with the Gas Council which, together with the Domestic S.F.A.A.C., has given it approval.

The boiler is designed to provide hot water and central heating. Flexible control of hot water output is provided by the incorporation of a centrifugal fan controlled by the thermostat through an interconnected solenoid-operated air damper. In addition, an adjustable air control provides a bypass supply of air to the combustion chamber if required. This combination enables the boiler to operate effectively over the full temperature range between 90 deg.F. and 190 deg.F. at all outputs.

Including the hopper, the Redfyre Autocoke 40 has a fuel capacity of 50–70 lbs., depending on the types of cokes used. Under average conditions, once-a-day refuelling is sufficient, but on low output the boiler can run for up to two days without re-charging.

Careful design has simplified refuelling. Below the full width refuelling lid a tapered chute—wide enough to prevent clogging—channels the coke straight from the hod into the hopper. To maintain the overall good appearance this chute, like the lid and top plate, is finished in birch grey vitreous enamel.

Another novel feature is the working level de-ashing system which enables the tallest person to stand upright while riddling the boiler. An arm height lever at the top left hand side is moved forwards and back to operate the shaker grate.



The Redfyre Autocoke 40

Considerable care has been taken over both the interior finish and external design. Styled by Brian Asquith, A.R.C.A., the boiler's lines match those of the most modern kitchen equipment. The cabinet is finished in white stove enamel with the top in birch grey vitreous enamel.

The laminated wood de-ashing handle is grooved at one end so that it both slots into the lever and doubles as the lifting tool for removing the large ashpan.

The Redfyre Autocoke 40 stands 36 in. high—37½ in. at the back—is 22 in. deep and 20½ in. wide. Flue offtake is a 5 in. diameter pipe from the top incorporating a flue break which eliminates the need for additional dampers or draught stabilizers. Designed for indirect systems, the boiler has four 1½ in. tappings, two at each side, and its capacity is a 35/40 gallon cylinder plus 170–180 sq. ft. radiator surfaces. If required the boiler can be controlled by a room thermostat, provided this is suitable for mains voltage load, and a time switch can be incorporated in the heating system to control the circulating pump but not the operation of the boiler.

M.O.H. RESIGNS OVER CLEAN AIR

It is reported that the Medical Officer of Health for Ashton-in-Makerfield, Lancashire, Dr. George Fulton, has resigned because of the refusal of the Urban District Council to implement the Clean Air Act by introducing smoke control areas. According to a Guardian (February 11) report, "while neighbouring local authorities introduce smokeless zones, this miners' town, which has just seen the last of its five collieries close, continues to swear by coal fires half way up the chimney as a specific against the winter".

"Wigan Corporation officials have pointed out the frustration of creating their own smokeless zones from their black-sheep neighbour Ashton, belching to windward".

One argument advanced is that the Council refuses to take action until the Ministry pays the full cost of adapting grates and controls the cost of smokeless fuels.

Dr. Fulton has been Medical Officer of Health at Ashton-in-Makerfield for seventeen years.

Publications Received

France.—The October, 1962, issue of the Journal of the Association for the Prevention of Atmospheric Pollution contains among other features articles on "Green Spaces and Public Health" and one grit removal equipment at the Vaires-sur-Marne electricity generating station. Another article is on the measurement of air pollution.

Australia.—The Proceedings of the Clean Air Conference held in Sydney in February, 1962. This is in two quarto volumes, in duplicated typescript, and contains the 27 papers presented at the conference, reports of which we published in earlier issues.

Clean Air on the Air

While the subject of clean air was in the forefront of peoples' minds Granada Television put on a feature titled "Air Pollution". Broadcast in early January it began with a simple statement of fact: Clean Air is Your Affair—and went on to say that the National Society for Clean Air said so! The commentary continued by referring to the enormous cost of air pollution to the country and reminded viewers that the highest bronchitis rate in the world was found in Britain and that in smoky industrial areas the highest rate of all was found.

The cameras then illustrated the work being done by schoolgirls from the Derker Secondary Modern School in connection with the recording of air pollution statistics. The equipment in the school science laboratory was shown and mention was made of the fact that at weekends and holidays the girls go in voluntarily to keep the records going. The commentator pointed out that the girls had learned a lot about the dangers of dirty air and were now carrying their smog masks whenever there was any suggestion of fog in the weather report.

Facts were then given about the implementation of the Clean Air Act in the north-west of England. Reference was made to the 26 local authorities who had not introduced any smoke control schemes at all and six of the towns in what are known as the black areas were named in the programme.

Manchester was mentioned as a black area but it was pointed out that since 1946 the problem had been tackled with a fair amount of success and that at Trafford Park atmospheric pollution has been halved in seven years.

Ashton-in-Makerfield came in for severe handling and the town council was referred to as "refusing to acknowledge that clean air was their affair" despite the information given by their Medical Officer, Dr. G. A. Fulton that bronchitis had been associated with 30 per cent. of the deaths in the town during November. In fact after being given this information they passed a resolution which completely rejected the whole principle of the Clean Air Act.

The programme concluded by expressing the hope that Ashton-in-Makerfield was big enough to see its mistake and change its mind in the near future.

North-West Division

Allegations that sulphur gases and not smoke are the great enemy and that the Clean Air Act is a failure, were described as "ill-informed and often hysterical criticism", by the Chairman and Hon. Secretary of the North-West Division of the Society, according to the Manchester *Evening News*, reporting the annual general meeting of the Division at Blackpool on February 7.

Presenting the annual report, the Hon. Secretary, Mr. R. J. Stanyard, said the Divisional Council's decision that publicity and membership should be the keynote of their efforts during the past year was fully justified by the volume of criticism of the Clean Air Act that arose in December following the smog.

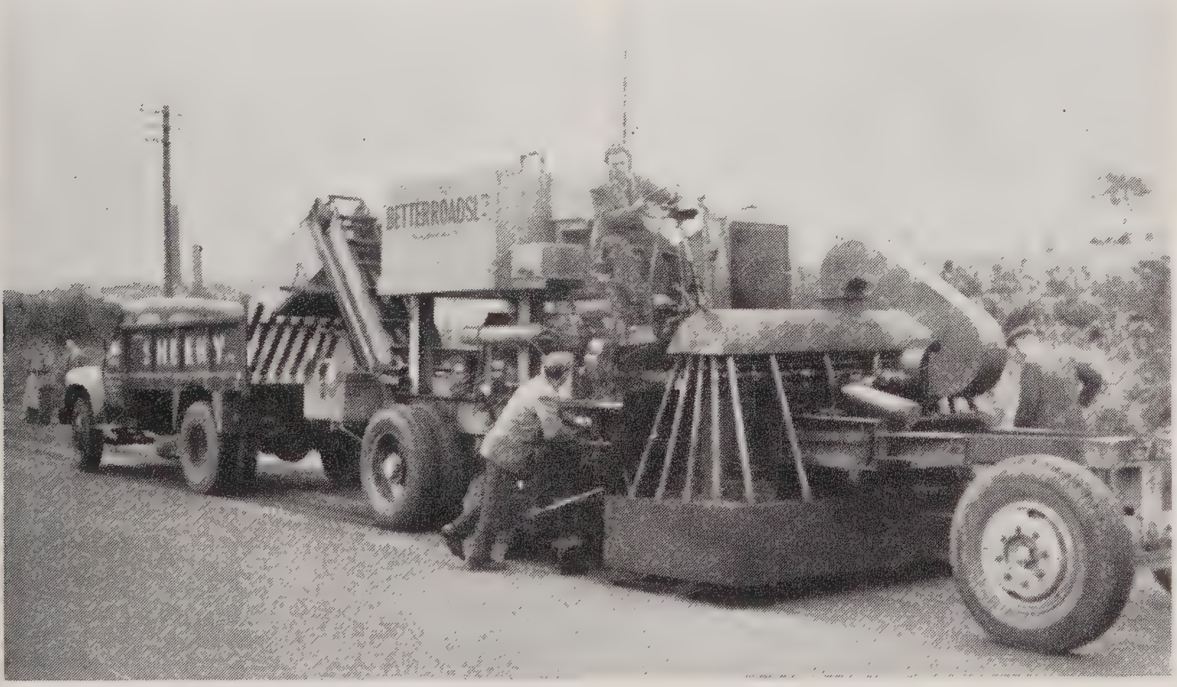
Councillor William Smith, of Padiham, called on the Society to take more active steps to answer opponents of the clean air campaign.

The Divisional Chairman, Mr. J. Rodgers, said that the North-West was leading the way in Britain's clean air campaign.

Fumes from Cars: Californian Approvals

Two devices for reducing fumes from crankcases in *used* petrol-driven cars have now been approved by the California Motor Vehicle Pollution Control Board. Approval of the units, the cost of which will be between $15 and $18, means that every car registered in the larger metropolitan areas of California must be equipped with a crankcase unit during the two years beginning January 1, 1964. New cars already come equipped with such devices. The units are expected to reduce total emissions by 35 per cent. No exhaust control system has yet been approved. (See Abstract 661).

A paper on "Atmospheric Pollution from Industrial Premises", by E. T. J. Fuge, District Inspector of Alkali, etc., Works, was presented at a meeting of the Royal Society of Health at Stockton-on-Tees on February 28.



One of the most objectionable and intractable pollution nuisances is the black smoke from road-heating and planing operations. There is, therefore, much interest and hope in the new machine (above) the Sheepbridge Smokeless Road Planer. Invented and designed by E. S. Parkin, of Better Roads Ltd., it is now being manufactured by Sheepbridge Engineering Ltd., Chesterfield, and trials and demonstrations in different parts of the country are now beginning

AIR POLLUTION ABSTRACTS

645. Effects of Air Pollution on the Atmospheric Corrosion Behaviour of some Metals and Alloys. Tice, E. A. (Jour. Air Poll. Contr. Ass. Dec. 1962, **12,** 553-559). Engineers and architects have long been concerned with the atmospheric corrosion behaviour of metal and alloy structures exposed to the weather. It is recognized that material performance is dependent not only upon humidity and rainfall, but also the nature and amount of atmospheric pollution prevailing. An assessment of the effects of such pollution on a variety of metals and alloys is presented, based on long-time atmospheric test programmes. Materials included are steels, galvanized coatings, stainless steels, nickel, and copper-base alloys. The author concludes that from the standpoint of corrosion, SO_2 content and soot accumulation are the most aggravating factors, and if practical means could be developed to reduce those two pollutants, the useful life of many metallic installations could be greatly increased.

646. The contribution to Air Pollution by Pigeons. Braverman, M.M. et al. (Jour. Air Poll. Contr. Ass., Dec. 1962, **12,** 570-1) In order to measure the amount of air pollution originating from pigeons in New York City, uric acid was determined in suspended particulate matter by a modified folin method. It was found that every cubic metre of air contained about 0·16 microgrammes of uric acid. Pigeon excreta is also a carrier of pathogenic disease germs and therefore is concluded to be a source of pollution and health danger.

647. Motor Vehicle Emissions and their Effects. Larsen, R. I. (U.S. Public Health Reports, November 1962, Vol. **77,** No. 11.) Highlights of the papers from two conferences held in Los Angeles in December, 1961, which presented current research findings on quantities and types of air pollutants from motor vehicles and the effects of these pollutants on the health of man, plants and laboratory animals.

648. Atmospheric Pollution in a London Park. Wainwright, C. W. K. and Wilson, M. J. G. (Int.J.Air Wat. Poll. 1962, **6,** 337-347.) The concentration of atmospheric sulphur dioxide was recorded at a point in Hyde Park, London, and traverses of the Park were made with portable apparatus. The rate of decrease of concentration with distance from the upwind edge was found to be closely related to the lapse rate but not to the wind speed. The rates of decrease with distance were greater than those calculated from the work of Lucas, and even large adjustments to his treatment would not make it fit all the experimental results. It is suggested that the discrepancy may be partly due to a current of cleaner air which descends into the Park by natural convection.

649. Estimation of Smoke Samples. (In French) Rondia, D. (Int.J.Air. Wat. Poll.) 1962, **6,** 353-375. Three routine methods of estimation of smoke sample (collected by filtration through fibrous media) are described; their standard error is calculated and the results compared. A statistical computation of the differences, according to seasons and sampling sites, points to the influence of numerous factors responsible for the amplitude of the error in each method. In conclusion, the reflectometric method shows less variability but it is recommended to complete the quantitative estimation of suspended particulate matter with another determination of a more qualitative character.

650. Motor Vehicles, Air Pollution and Public Health. Prindle, R. A. and Yaffe, D. (U.S. Public Health Reports, November 1962, Vol. **77,** No. 11.) With the passing in 1960 of the Public Law 86-493, added impetus has been given to the study of motor vehicle emissions by the U.S. Public Health Service. The principal sources of automobile pollution and the magnitude of this problem in the U.S. are described. It has been shown that vegetation can be severely damaged by some of the substances in the automotive exhausts and studies on animals have demonstrated that they were especially susceptible to severe pulmonary disease after being exposed for some weeks to an extra strong concentration of motor exhausts. From the various studies on the possible role of motor vehicle exhausts in the causation of cancer, it appears that air pollutants related to such emissions play a part, at least as a co-factor in the production of lung cancers. The existing air pollution standards in the U.S. and the planned control of motor vehicle emissions are described.

651. Health Effects from Repeated Exposures to Low Concentrations of Air Pollutants. Prindle, R. A. and Landau, E. (U.S. Public Health Reports, October 1962, Vol. **77,** No. 10). The great volume and variety of air pollutants in the United States offers unique opportunities to study the chronic effects of low level air pollution on health. The authors describe two kinds of research in this field: (a) the repeated laboratory exposure of human and animal subjects to specific pollutants or mixtures; and (b) the epidemiologic approach, using the community as a field laboratory. From these studies they conclude that longtime exposure to low concentrations of air pollution does result in adverse health effects. The evidence as yet is only qualitative; much more will have to be done before the necessary quantitative answers are found on which to base rational control standards.

652. Air Pollution and New Orleans Asthma. Lewis, R., et al. (U.S. Public Health Reports November 1962, Vol. **77,** No. 11.) A series of investigations was carried out by Tulane University to determine the source and nature of air contaminants which produce asthma in New Orleans, La. A number of air pollutants were collected and analysed and their prevalence was compared with the prevalence of asthma outbreaks. A statistically significant relationship was found between the daily asthma admissions at Charity Hospital emergency clinic and the prevalence of one air pollutant, a poor combustion particle with associated silica. No relationship was shown between concentrations of other pollutants and the number of reported asthma attacks.

653. Carbon Monoxide in Town Air: An Interim Report. Lawther, P. J., Commins, B. T. and Henderson, M. (Pap. to 13th conference of the British Occupational Hygiene Society; Ann. Occup. Hyg. Oct./Dec. 1962, **5,** 241-246, 247-248.) The methods of sampling and analysis and the series of measurements taken are stated with little comment other than some concentrations quoted. With discussion. 6 refs.

654. Carbon Monoxide Pollution in Marseilles Thoroughfares. (In French) (Bull. Acad. Nat. Med. May 1962, **146,** (17/18), 368-374; Occup. Hyg., December 1962, **37,** (12), 1233.) Samples taken at head level at all times of day showed maximum readings of 70 p.p.m., less than the toxic threshold of 100 p.p.m. Wider roads, preservation of open spaces, reduction of parking in narrow streets, effective ventilation of underground traffic areas and reduction of toxic content of exhausts are recommended.

655. Comprehensive Analyses of Automotive Exhausts. Hurn, R. W. (Arch. Environ. Hlth., December, 1962, **5,** 592-596.) A general review of exhaust composition, including analytical methods, inert, reactive and noxious constituents, and of hydrocarbon measurements and variations in composition of exhaust emissions.

656. Gravimetric Method of Determination of Dust in the Atmosphere using the Fabric Filter FPP-15-1.5. (In Russian) Gil'denskoil'd, R.S. and Minaev, A. A. (Hyg. & Sanit., Moscow, Jan. 1962, **27,** 40-46; APCA, Nov. 1962, **8,** (6), 4.) A method is described for determining the dust content of air with the help of the fabric filter FPP-15-1.5, obtainable by means of electrostatic spinning. A constant charge on the cloth promotes the settling of aerosol particles upon its surface. The small weight of the cloth itself allows microweighing to be carried out. Verification of the results from this technique and of the comparison of these results with those from other methods, are discussed.

657. Cleaning the Air. Lessing, R. (Chem. & Ind. Lond., Dec 1 1962, **48,** 2032-2033.) A general review ending with a mention of the 45 articles published as "Air Pollution" edited by A. C. Stern.

658. Action of Cement Dust on Plants. (In German) Czaja, A. T. (Staub, 1962, **22,** 228-232.) Leaching of the cement encrustation found on plants forms calcium hydroxide which destroys the tissues of the epidermis.

659. Improvements in or relating to Devices and Apparatus for collecting Solid Matter in the Atmosphere or the Like. Lucas, D. H. and Spurr, G. Central

Electricity Generating Board; (B. P.909, 535/1962) The apparatus described will sample windborne grit large enough to settle in calm surroundings.

660. A Case of Damage to Greenery by Fluorine. (In Russian) Petrov, V. I., Pinskaia, F. S. and Logacheva, L. I. (Hyg. & Sanit. Moscow, Jan. 1961, **26,** 77 et seq; Met. Abs., May 1962, **13,** 1179.) At Dnepropetrovsk, trees 50-150 m. east of a factory manufacturing enamel ware, were damaged by hydrogen fluoride in the air. Charring of leaves was observed in conditions of high humidity, low cloud cover and a westerly wind. Leaves yielded 0·6 mg. fluorine per kg.

661. Automobile Exhaust Control Devices. Faith, W. L. (Jour. Air. Poll. Contr. Ass. January 1963, **13,** 33-37). The author describes requirements of the California Motor Vehicle Pollution Control Board before exhaust devices can be certified for mandatory use on vehicles. Chemically, a successful exhaust control device must reduce hydrocarbons by 80 per cent. and carbon monoxide by 60 per cent. Five devices so far have cleared this preliminary hurdle and have been accepted for Step 1 formal testing. The complicated testing procedure is outlined; also Step 2 or criteria testing, which is concerned with cost, excessive heat, danger, etc. The high standards of these criteria will make a certification of afterburners difficult. The firms which have submitted their devices for testing to the Board are listed. With the precedent of the crankcase or blowby control device being fitted on all new domestic cars in the U.S. from 1963, one can suppose that the introduction of afterburners on California cars may be quickly followed by adoption nationally. There are, however problems of cost, location and weight. It is unlikely that the first afterburners will appear on cars before 1967, in which case, the author concludes "we may well have a man on the moon before we have afterburners on motor vehicles".

Solid Smokeless Fuel Survey

The February, 1963, issue of *Coke and Gas* contained a leading article on "A New Look at Clean Air", in which the solid smokeless fuel situation was informatively surveyed. The concluding paragraph was as follows:

"This examination of the situation suggests that overall there ought to be adequate supplies of solid smokeless fuel, at least for the next few years, but there would appear to be some problem of distribution since production tends to be concentrated in certain districts. So far as the premium quality cokes are concerned, Coalite and Rexco are concentrated in the Midlands and little or no reactive coke is made in Scotland and the North-East Coast, but we understand there are plans for a Rexco plant in Scotland. There are suitable coals in Northumberland and Scotland and, indeed, the original production of coke similar to Cleanglow was made at Edinburgh. It seems surprising that, after the Clean Air Act has been in operation for several years, arrangements have not been made by one or other of the solid fuel interests to provide suitable fuel in all districts".

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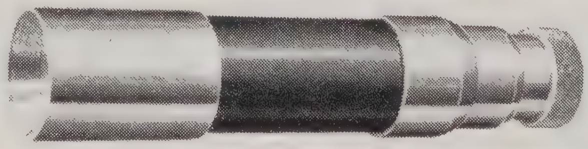

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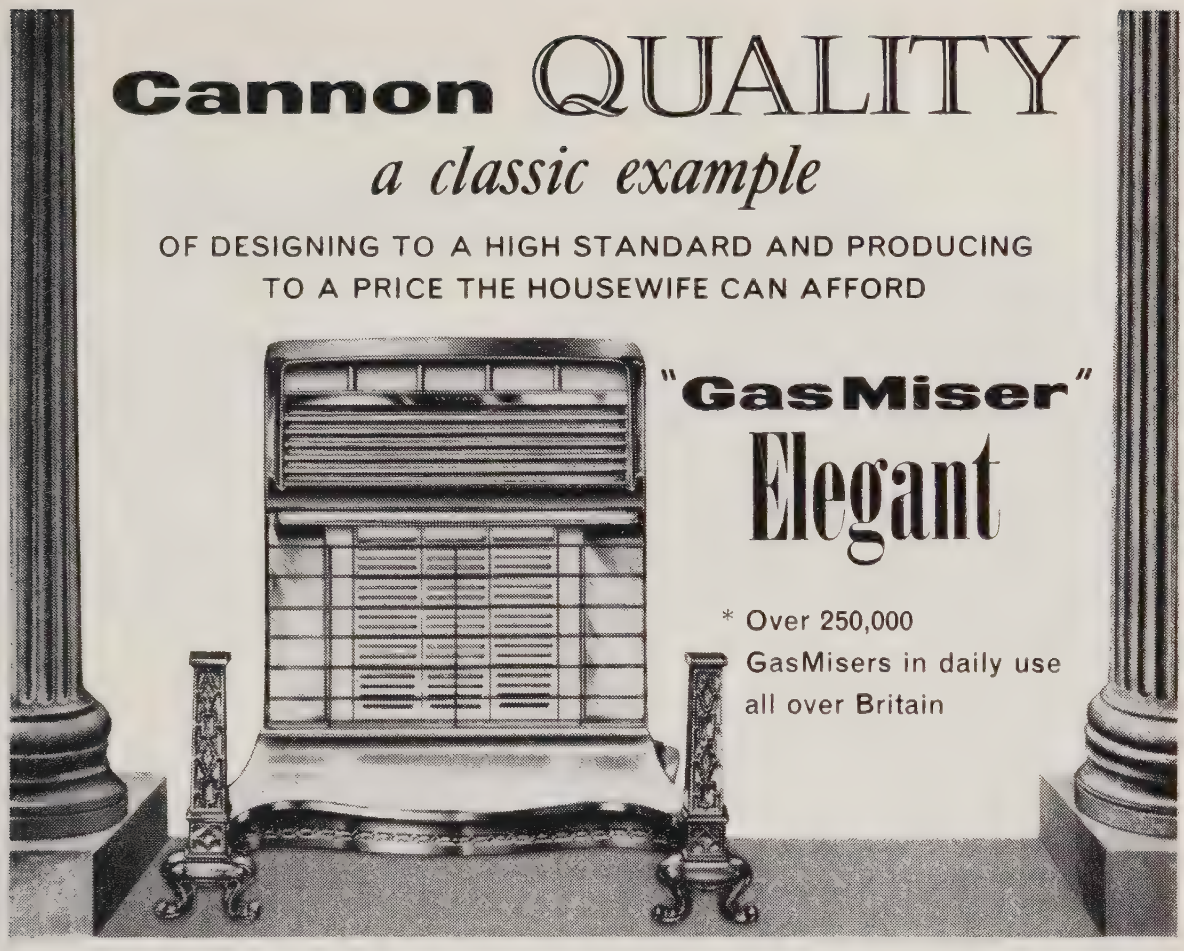

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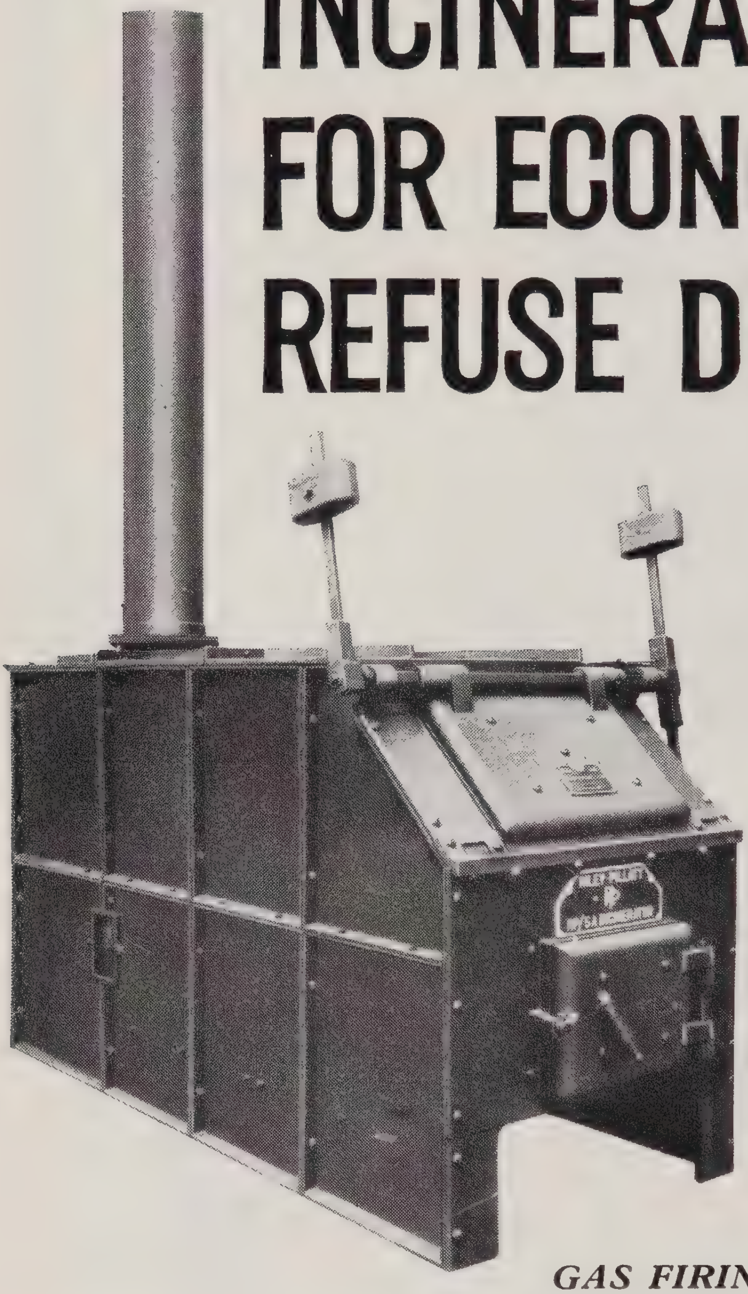

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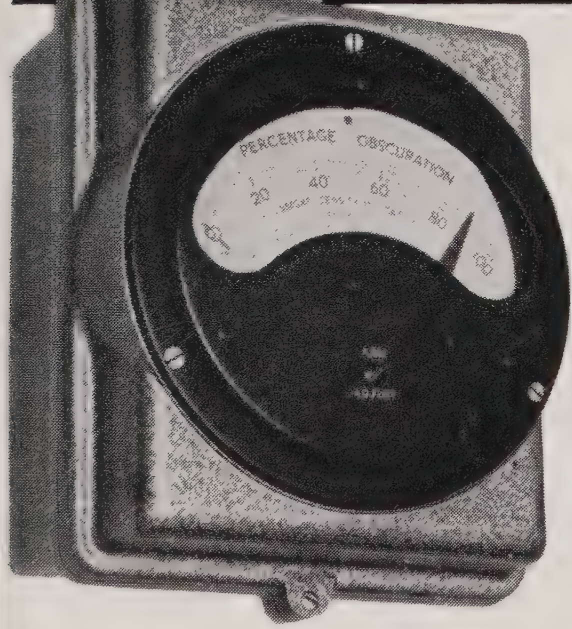

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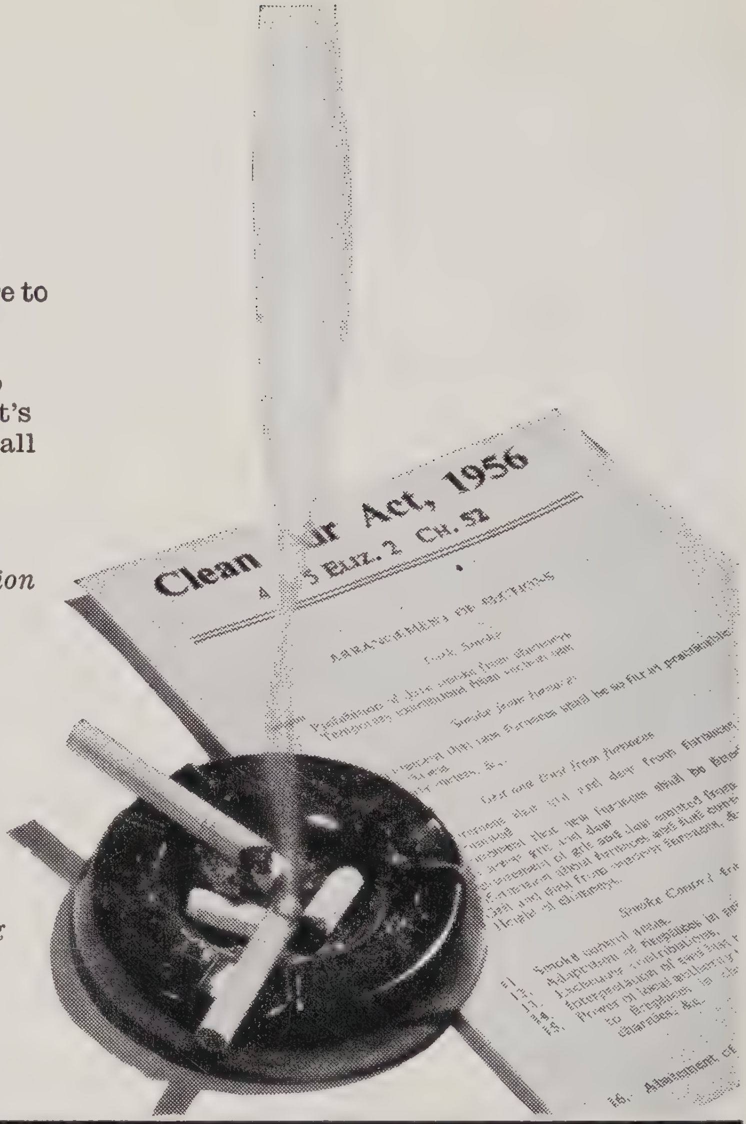
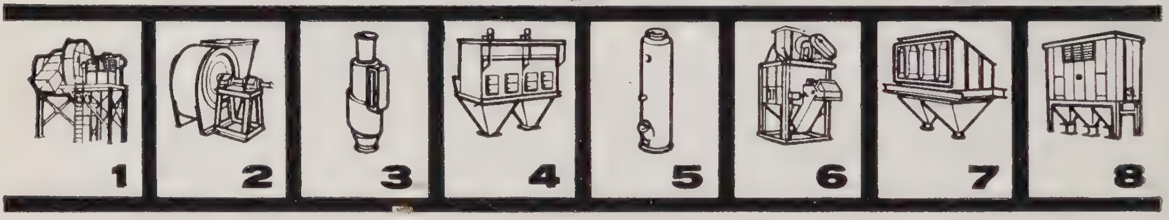


Clean Air Act, 1956
4 & 5 Eliz. 2 Ch. 52



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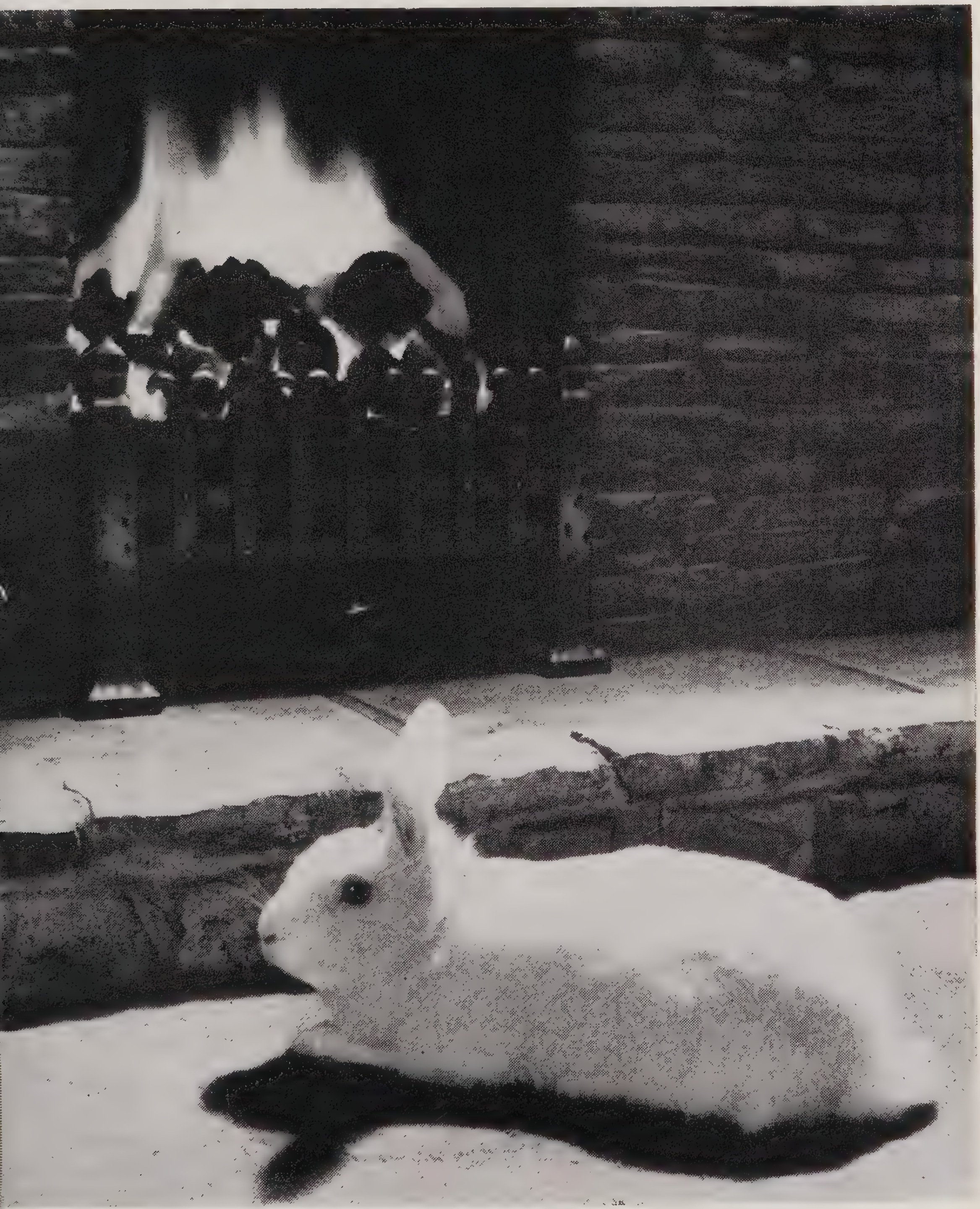

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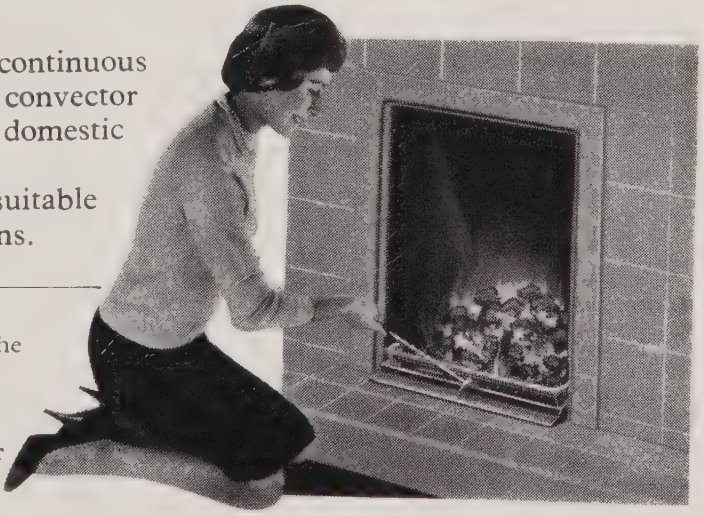

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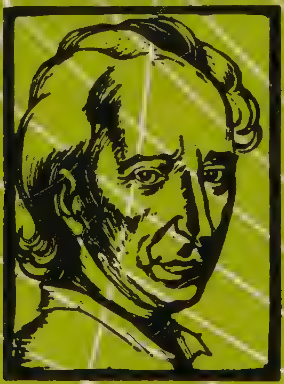

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In this Issue

Centenary of the Alkali Act ★ The Closable Stove ★ The December Smog ★ Air Pollution from Road Vehicles ★ Cobwebs ★ Smut Emission

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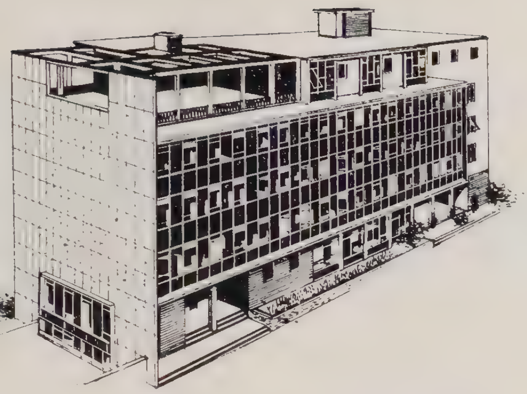

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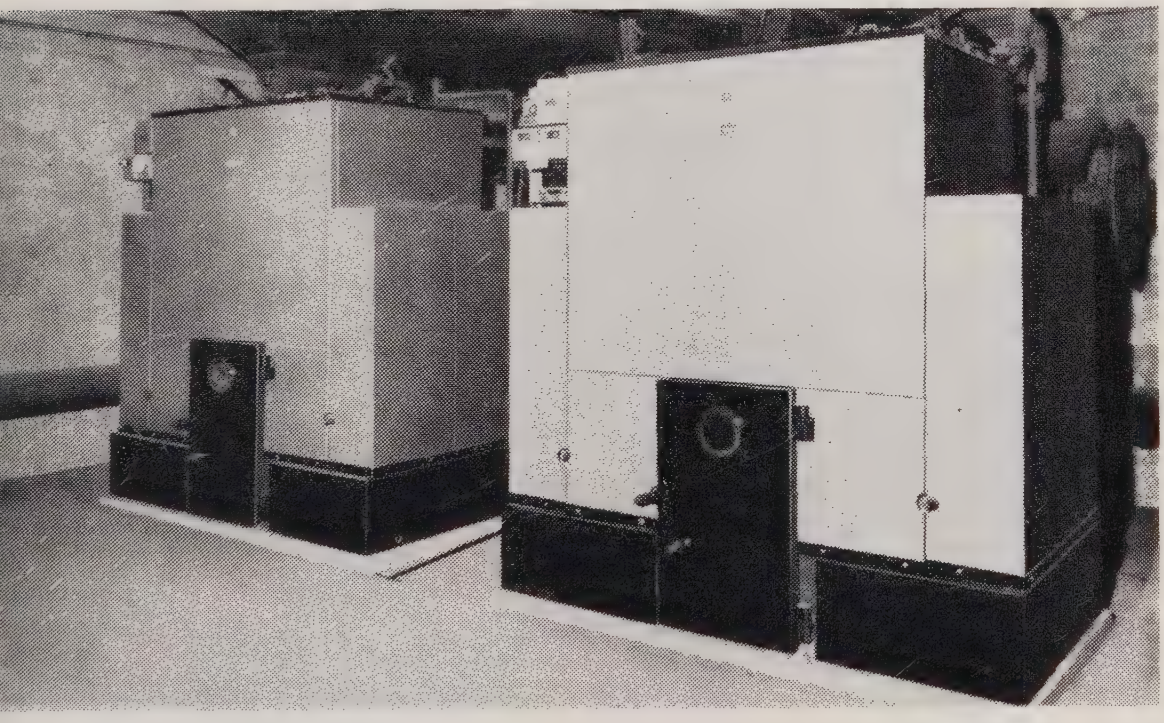

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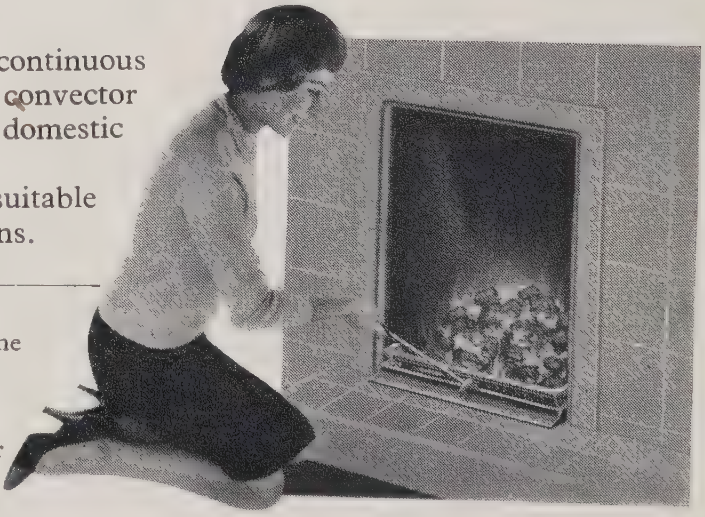

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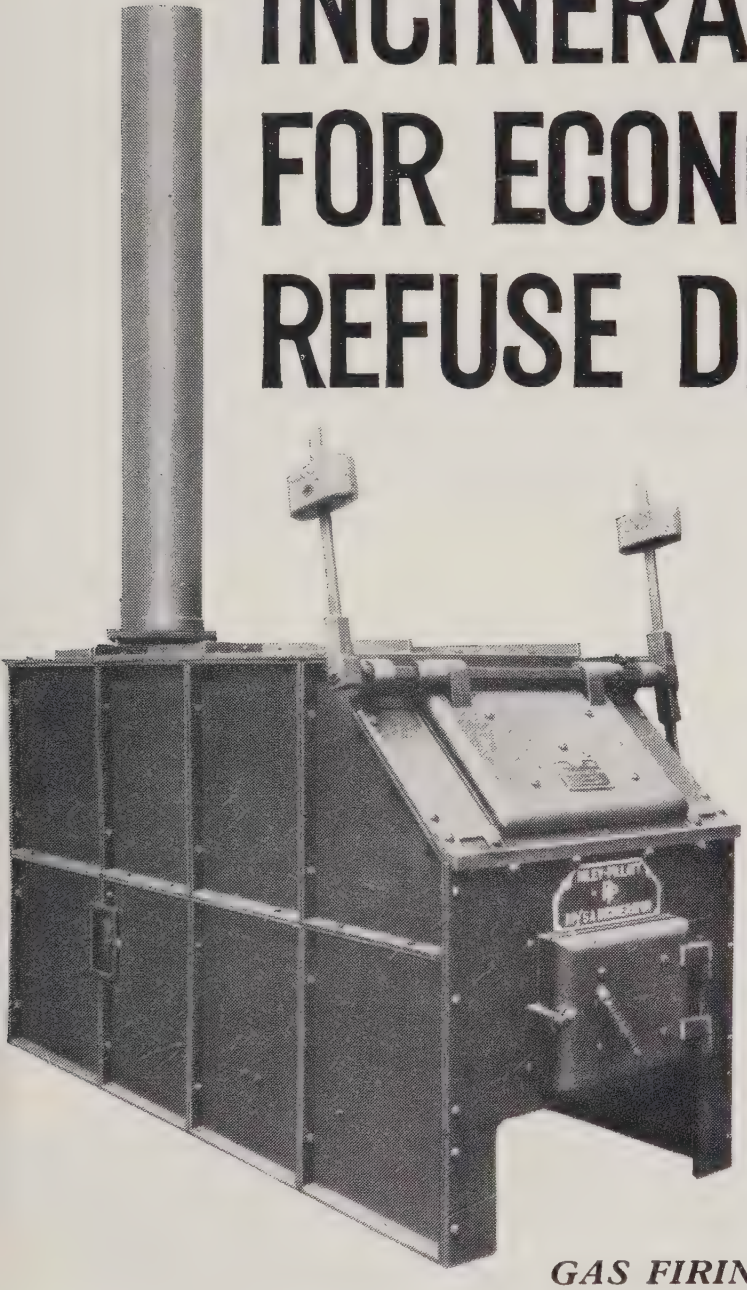

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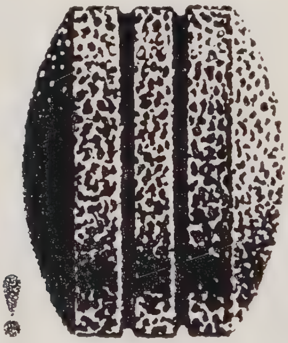

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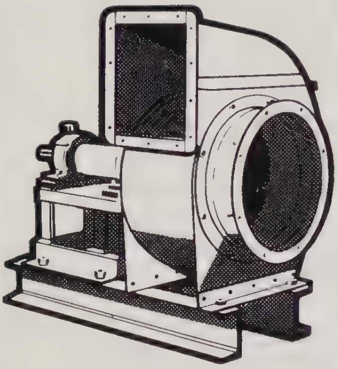

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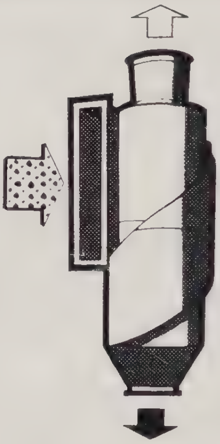

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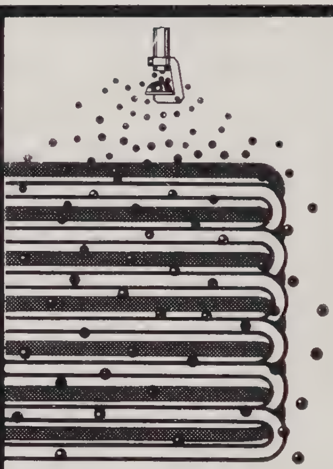

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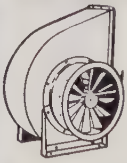

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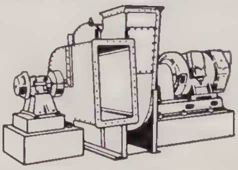

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MEMBERSHIP of the Society is invited and is open to individuals, local authorities, firms and other corporate bodies. Full details and membership application forms will be sent on request.

Now is the time for Publicity

New Material from the Society

To be published shortly is a new colour leaflet for bulk sale to local authorities and others, entitled "Smoke—Affects Your Health. Affects your Wealth." Also a "For Clean Air" photographic poster for local overprinting. In preparation is a Clean Air Bookmark, which it is hoped local authorities will distribute through their libraries. New display kits (photographs and caption panels) for assembly on purchasers own backgrounds, will also be ready shortly. Full details of other exhibits, samples of leaflets, etc., from the Society on request.

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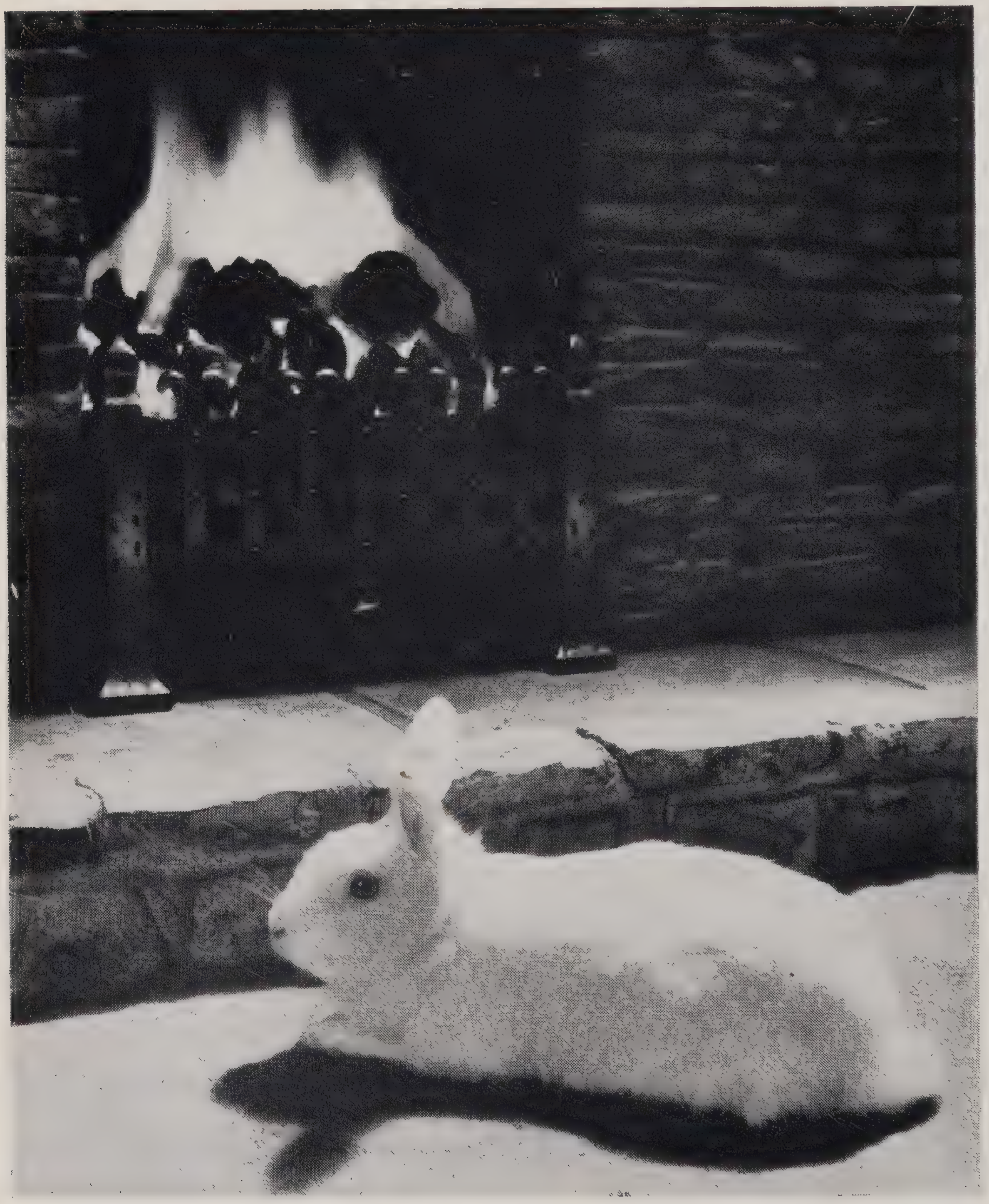

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SMOKELESS AIR

Vol. XXXIII No. 126 Summer 1963

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Ships, towers, domes, theatres and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

THE CLOSABLE STOVE*

THE closable stove may also be called the openable stove, or if "stove" is regarded as not quite the best word, it may be called a room heater. Whatever its name, it is an appliance to which much thought and discussion is being given. The solid fuel interests are seeking to make it more popular, and from the clean air viewpoint its use on a far greater scale than at present would be invaluable. The Society's Yorkshire Division has recently been discussing it, and has passed a resolution urging that the installation of closable stoves in a smoke control area should rank for grant generally.

It will be recalled that conversion grants are so payable in the North East region, and that this concession was made because solid smokeless fuels suitable for closable stoves are plentiful in the area, whereas the more freely-burning fuels, suitable only for open fires, are less abundant. There is a strong case for making this facility apply to all the other "black areas".

The advantages of closable stoves, compared with other solid fuel appliances, may be itemized thus:

1. The stove is highly efficient and therefore economical to run, and because of its controlability it can use the fuels that are in good supply, such as the hard coke "Sunbrite" and the low volatile steam coals or semi-anthracites. The more stoves there are in use the easier is the solid fuel availability problem in any given area. If the supply of open-fire cokes should begin to diminish because of the revolutionary changes now beginning in the gas industry, the stove will become even more important.

2. Consumer needs can be fully met with the closed stove. He can use it closed, for efficiency and economy, or he can open it when he wants to enjoy open fire conditions. He can burn not only the harder fuels but, if he prefers them, the free-burning or premium fuels (especially in the smaller sizes). In terms of useful heat the closable stove is the cheapest form of continuous domestic room heating. The stove need never go out, and even at night can provide useful background warmth to much of the house.

3. In times of fuel supply difficulties, as during last winter, the closable stove, because of its low fuel consumption, can make a little fuel go a long way, and so can lessen the anxieties of the householder and the problems of the distributors. If hard winters, such as that from which we have just suffered, were more common, sheer necessity would have made the closable stove the standard appliance

---

* This article was written and in type before the announcement in Parliament that there was to be an immediate review of the smokeless fuel situation, including the practicability of encouraging the greater use of the closable stove. See page 278.

in our homes, just as it is in the northern European countries.

4. From the smoke prevention viewpoint it does not matter whether smokeless fuel is burned in an open fire, even of a primitive type, or in a closable stove. But the latter is the only immediately practicable way of reducing the emission of sulphur dioxide and other gases emitted on burning any solid fuel. Concern about the reduction of sulphur emissions does not take us far unless it takes into account the million or so tons of sulphur dioxide emitted from our homes at low levels, mostly in densely populated areas, and mostly during the months of cold weather and fog. Unless, or until, solid fuel ceases to be used in the home, it is difficult to envisage how the sulphur can be eliminated. But if the closable stove were substituted for the open fire, the consumption of fuel could be cut by one half or more, and the sulphur dioxide correspondingly reduced. This would be something well worth achieving, and it could be started straight away.

The Difficulties

What of objections or difficulties to the wider use of the closable stove? As far as smoke control areas are concerned the question that first comes to mind, though it is not the main one, is that of grant. A stove costs more than an open fire, and consequently the cost of conversion is increased for each of the three parties concerned—the householder, the local authority, and the Treasury. The householder should find it well worth while because of the fuel he will save; but the capital cost of clean air, to the community, will be increased without any obvious return above that obtained if a cheaper appliance is installed. Nevertheless, if this capital cost is compared with the annual running cost of air pollution it is indisputable that a policy of grants for stoves in all the black areas would be economically sound and eminently sensible. The difficulty lies in putting the case over and getting it accepted with conviction.

The other difficulty, and the major one, is that, despite its advantages, the closable stove is still far from being popular enough to make a material difference to smoke control progress, even if grants were approved for all regions. Although there are of course many thousands in use, and giving every satisfaction, the stove has not yet "caught on", though perhaps last winter's experiences may be helping. We are sure that to extend the grant concession from the North East to all areas would, to begin with, be an imperceptible addition to both rates and taxes. What is important is that there should be a much bigger drive to popularize the stove. On this we believe the Ministries concerned, the National Coal Board, the fuel and appliance manufacturers, the local authorities, and all the clean air organizations, must see eye to eye. We have seen what can be done to promote central heating, and what enormous sums have been spent in doing so. This too is welcome to the clean air movement, although it has little effect on the congested areas of small houses where most of the smoke originates. The market for the closable stove is far bigger though less profitable per unit, and to win it would be much more helpful to the progress of smoke control. With this, plus the much greater use being made of gas, electricity and oil, the prospects for eliminating smoke in the black areas in reasonable time would become brighter than at any time since the Beaver Committee reported.

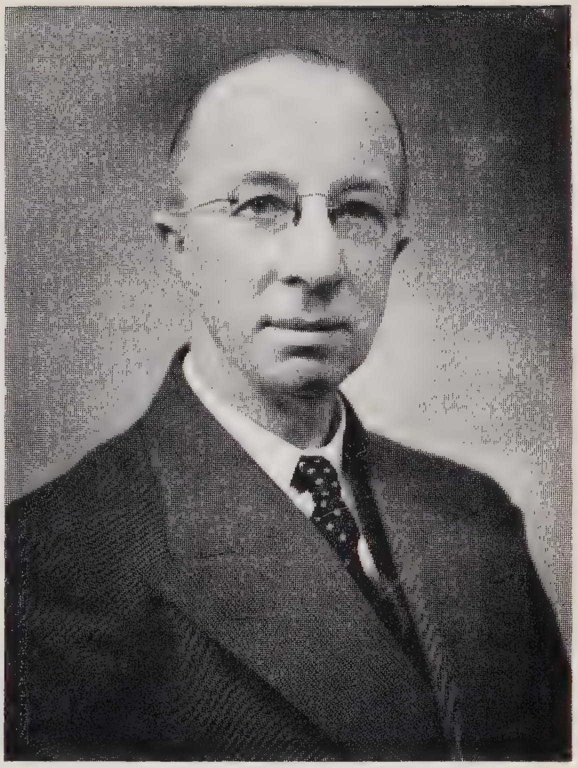
The Society's Officers

At the Annual General Meeting on April 17, in addition to the election of Dr. Parker as the new President, the re-election was announced of Mr. Stanley Cohen, C.C., as Hon. Treasurer. The meeting also re-elected, with an expression of appreciation of their services, Messrs. Geo. Little, Sebire and Co. as Hon. Auditors. The names of the newly elected and newly appointed Executive Council were

The New President

At the Annual General Meeting of the Society on April 17, the election was announced of the new President to succeed Lord Cohen of Birkenhead, Dr. Albert Parker, C.B.E. Dr. Parker is well known to all who are concerned with clean air, and he has helped and been associated with the society for many years, as an individual member and as a Des Vœux Memorial Lecturer. Now a chemical engineering consultant, he became directly concerned with air pollution as Director of the Fuel Research Station of the D.S.I.R. Graduating at Manchester University, he was awarded the D.Sc. at Birmingham, was later in charge of research and development for the Institution of Gas Engineers at Leeds University, and before going to the Fuel Research Station was Director of Water Pollution Research in the D.S.I.R.

Dr. Parker has many lecturing honours, and is Hon. Secretary of the British National Committee of the World Power Conference and Chairman of the Consultative Panel on World Energy Resources of the International Executive Council of the Conference. He is also Executive Vice-President of the Royal Society of Health and has been Chairman of its Council. He was Chairman of the Expert Committee on Air Pollution of the World Health Organization in Geneva, and is a Vice President of the Institution of Chemical Engineers and of the Institute of Fuel.



Albert Parker, C.B.E., D.Sc.

We are honoured that Dr. Parker should have accepted the Presidency of the Society, and we look forward to hearing his first Presidential Address at the Scarborough Conference in October.

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also announced. There have been only a few changes and the full list is published in the new Clean Air Year Book, together with the Society's Annual Report and the audited Accounts for 1962. At a meeting of the new Council held immediately after the A.G.M., Dr. J. L. Burn was re-elected as Chairman, and the Deputy Chairmen, Mr. James Goodfellow and Mr. T. Henry Turner, were also re-elected.

Election Prospects

On another page are outlined the plans for the next annual conference and exhibition, at Scarborough in October. October is continually being mentioned in the Press as a possible month for the general election. We hope that it isn't, and wish we knew. And if the election is not in October then the Conservative Party conference will be, and during the same week as our own. This is less serious, although it makes it difficult, as was also the case last year, for a Minister to visit us at Scarborough when he is due to be in Blackpool. However, we are pleased to be able to announce that the Joint Parliamentary Secretary to the Ministry of Housing and Local Government, the Rt. Hon. Lord Hastings, has kindly accepted our invitation to address us at Scarborough. He will open the Conference and the Exhibition on the morning of the first day, Tuesday, 8th October. We hope that members will agree that an interesting and well-balanced programme has been prepared, and—general election permitting—we look forward to a record attendance.

Uskmouth B

After the depressing reading of *Silent Spring* and *Our Synthetic Environment* (reviewed in this issue), on man's heedless and often tragic interference with the natural order—including Man himself—it was refreshing to read a *Times* report about how the Uskmouth B power station has adapted its annual maintenance programme for the benefit of the thousands of smolt (young salmon) that in their journey to the sea throng the estuary waters from which the station takes up to 30 millions of gallons an hour. The smolt remain in the vicinity for some time, apparently to acclimatize themselves to the change from fresh to salt water. To save their lives the station was closed down completely, and not in sections, for three weeks, to coincide with the arrival of the young visitors, and it was reported that "the number of smolts killed this year has been negligible".

Academic Argument

The arguments of those who object to smoke control are few in number and wherever there is opposition they crop up with monotonous regularity. A new one, straight and simple, was advanced recently in a public meeting at Dundee. It was that the Clean Air Act should be abandoned until it was possible to equip every home with a suitable electrostatic precipitator. The speaker was a schoolteacher.

OBITUARIES

We regret to record the death, at Twickenham on May 10, of Dr. Andrew Shinnie, formerly Medical Officer of Health for Westminster, and for a number of years a member of the Executive Council of the Society. He was 77.

Dr. Shinnie did much of lasting value in the field of preventive medicine, and his interest in clean air was deep. In addition to his long and happy association with the Society he was for many years the Hon. Treasurer of the Greater London (now London and Home Counties) Advisory Council for Clean Air. He had a depth of sincerity and understanding that earned respect, and a quality of wit and humour, sometimes teasing, sometimes sharp, that added affection to all who knew him.

We regret also to record the sudden and comparatively early death of C. A. Stansbury, Chief Public Health Inspector for Walsall, who was a member of the Society's Executive Council from 1947 to 1954, and who gave much valuable help to us during those years of rapid change and growth. He also did much to help in the establishment of the Society's new West Midlands Division, and he will be greatly missed by his many friends in the area, and especially by his colleagues for whom, through the Association of Public Health Inspectors, he worked untiringly.

Award to Mr. S. Cayton

Mr. Stanley Cayton, Chief Public Health Inspector and Cleansing Superintendent, West Bromwich, who is a member of the Society's Executive Council and Chairman of its Conference Committee, has been awarded the prize of 50 guineas in the John S. Owens Competition of the Royal Society of Health. The subject of the essay was "Smoke Control Areas: their organization, establishment and effect".

Gas Cokes as Open Fire Fuels

New Consumer Service

THE Ministry of Housing and Local Government has issued to local authorities a most helpful circular (The Clean Air Act, 1956, No. 7/63) in which are discussed problems arising from the use of gas coke in smoke control areas, and complaints that have been made about the delivery of coal in smoke control areas.

On coke, it is pointed out that the use of this fuel in an open fire is only one of many ways of heating rooms in smoke control areas. "However", continues the circular, "gas cokes, which include Gloco and Sebrite, are the cheapest smokeless fuels for open fires not having underfloor primary air supply, and the removal of any deterrents to their use is to the advantage both of householders and of the smoke control drive".

It is pointed out that gas cokes were used on a substantial scale in open fires for many years before the Act, "not because of any compulsion to use smokeless fuels but because the users found they obtained a good fire at a reasonable cost." The Peech Committee had stressed this, but had emphasized the need for good marketing and an effective consumer service.

One of the basic difficulties that have been encountered is expressed thus:

> "People who are unused to gas cokes on open fires not infrequently start by trying to burn the wrong sort of coke or by using the wrong sort of appliance. This cannot be expected to give satisfaction. An unfavourable impression of the performance of gas cokes on open fires is likely to be left with the householder, and this is liable to foster reluctance to consider their use for that purpose in smoke control areas".

The circular goes on to describe the steps that have been considered and agreed upon following discussions with the Ministry of Power and the producers and distributors of gas cokes. These are Gloco (the B.S.S. coke), Sebrite (S.E. Gas Board) and ordinary gas coke. All the Gas Boards except the North Western, now sell B.S. coke under the name "Gloco". Three main steps are being taken:

1. The distributors are taking steps to ensure that unsuitable grades of gas coke are not sold for use on open fires and that gas cokes are not knowingly sold as suitable open fire fuels to householders whose grates are not designed to burn them.
2. The producers and distributors are making arrangements to ensure frequent deliveries in smoke control areas in quantities suitable to customers' requirements.
3. The producers and distributors are setting up a consumer service to show any householder unused to burning gas cokes on open fires how they should be used for the best results.

These developments are most important, and are not before time. Complaints under any of the first two headings should be made to the Gas Board or other supplier, or to the local Coke Distributors' Association. Inquiries under No. 3 above should be made by local authorities to the latter organization. An appendix to the circular gives the names and addresses of the Secretaries of the Coke Distributors' Associations, as well as the names and addresses of the Coke Managers of the Area Gas Boards. Reference is also made to the Domestic Coal Consumers' Council, to which representations about coke and other smokeless fuels may be made, as well as about coal.

Coke Not Harmful

The circular goes on to refer to the

belief that coke fires are somehow harmful to health. Although this fallacy was discussed fully by Lord Cohen of Birkenhead in his Presidential Address to the NSCA conference at Harrogate last year (this journal, Winter, 1962, No. 124, p. 99), the circular's paragraph on the subject may be quoted in full:

> "The belief is held in some quarters that open coke fires are injurious to health. The Minister is advised that there is no reason whatever to believe a coke fire any more harmful to health than a coal fire. Coke is derived from coal and all the gases given off by coke are also given off by coal. The difference is that with coal the invisible gases are accompanied by smoke. So long as there is no downdraught in the chimney, and the room is not too tightly sealed against the entry of fresh air, the gases will go up the chimney whether coal or coke is used. Where downdraught occurs gases may enter the room whether coal or coke is being burned. The conversion of a fireplace in order to enable it to burn coke may well afford a convenient opportunity for dealing with downdraught if the fireplace is particularly subject to it. If a room is too tightly sealed by draught proofing or otherwise, the flow of air from the room into the chimney may be inadequate to carry away the gases from the fire and they may escape into the room".

The circular continues by stressing the need for open fires to have a 5/8th inch bar-spacing, and by pointing out that the "premium" or more reactive fuels, though they will burn well on improved fires, will burn better on the improved types. It goes on:

> "It is in the general interest that as wide a range of smokeless solid fuels as possible should be available to the maximum number of householders in smoke control areas. Local authorities are therefore asked to do all they can to encourage those householders who want open fires to replace unimproved fires by improved fires during the period in which grant can be paid on the expenditure, and to ensure that similar replacements are effected in their own houses".

Delivery of Coal

The second section of the circular deals with the practice that has been noted in some parts of the country, where bituminous coal is sold and delivered to householders in smoke control areas. A positive step to prevent or check this is reported:

> "The Coal Merchants' Federation of Great Britain has recommended its members to do everything they can to prevent bituminous coal being delivered on their behalf to premises in smoke control areas, other than premises subject to exemptions which allow coal to be burnt there. If local authorities inform the Federation, or its constituent associations, of any cases where bituminous coal is delivered to premises subject to a smoke control order the Federation will take it up with the merchant concerned".

An appendix to the circular gives the names and addresses of the Secretaries of the Federation and of its constituent associations. Mention is also made of the organizations that can be approached for advice on the selection of oil-burning appliances and the appropriate oil fuels for use in smoke control areas.

CHIMNEY HEIGHTS

The New Guide

Clean Air Act 1956: Memorandum on Chimney Heights. 1s. 3d. net; Circular No. 25/63, 3d. net. H.M.S.O.

This Memorandum will be welcomed by local authorities for simplifying and making more consistent their requirements under section 10 of the Clean Air Act. This section, it will be recalled, requires local authorities to satisfy themselves that new chimneys to which the section applies must be high enough to prevent, so far as practicable, smoke, grit, dust and gases emitted from the chimneys from becoming prejudical to health or a nuisance.

The new memorandum explains the

simplified method most lucidly and makes it very easy to apply. Since the purpose of controlling chimney height is to reduce the ground level concentration of sulphur dioxide and other gaseous effluents, the first factor to be dealt with in estimating the required height of a chimney is the quantity of SO_2 emitted per hour. Then the efflux velocity is referred to and its importance in avoiding downwash is stressed. Appropriate minimum velocities for different cases are indicated, and the method of calculation that follows assumes that the appropriate velocity will be achieved.

Then follows the important step of considering the nature of the district surrounding the chimney, and five types, from an undeveloped area with low background pollution, to a large city or an urban area of mixed heavy industrial and dense residential development. Charts are given for installations of different sizes—very small, small, medium and large—relating to SO_2 emissions ranging from 30 to 1,800 lb. per hour, and by projecting a line through the SO_2 (in lbs. per hour) emission and the point given for the appropriate district, a figure for "uncorrected chimney height" is obtained.

The final factor is then introduced: the influence of the effects of the height and greatest length of the building to which the chimney is attached or of any other building in the immediate vicinity. If the uncorrected chimney height is not less than 2½ times the height of the building no further adjustment is needed, but otherwise reference must be made to a further chart, from which, by the projection of a line from point to point a "final chimney height" is obtained. The greatest chimney height allowed for is 260 feet. Examples are given of how the method is to be used.

The circular that accompanies the memorandum points out that the method described is to be regarded only as a guide to the final decision in any instance, and should be modified in the light of circumstances and the definition, given in the Act, of the word "practicable". It is also pointed out that "consultation between the local authority and local planning authority will be necessary where the height of a proposed chimney needs to be considered from the point of view of amenity as well as that of public health".

Scottish Clean Air Exhibit

An exhibit on the effects of air pollution and the need for domestic smoke control has been prepared for the Scottish Development Department by the Central Office of Information and is now available on free loan to local authorities through the Scottish Information Office. The exhibit is approximately 6 ft. in height by 6 ft. in width. It is supplied in a stout container with full instructions for its erection and can be mounted in a very short space of time. It is suitable for display in local authority offices, public libraries, schools, etc., or at special exhibitions on domestic smoke control.

The exhibit is in two parts. The first deals with the effects of air pollution on health and the economic losses it can cause, with suitable illustrations. The second shows the places in Scotland where smoke control area orders have been made and gives advice to householders on the operation of the Clean Air Act. Illustrations show types of heating which can be introduced in place of coal burning open fireplaces.

The exhibit is now completed and was shown at the Annual Conference of the Scottish Division in Inverness on May 23rd and May 24th.

More than the Roads

Every year more than five times the number of people killed on the roads die through smoke pollution, stated Sir Robert Nimmo, Chairman of the Scottish Gas Consultative Council, at a recent meeting.

The Centenary of the Alkali Act

by

J. S. Carter, C.B.E., D.Sc.,

Chief Alkali Inspector

THE first Alkali Act came into being on July 28, 1863. The measure was of importance on two counts. Firstly it was the start of the present legislation whereby control of emissions from a great variety of processes is entrusted to the central authority. Secondly, it was the consequence of a prudent and far-sighted decision. Hitherto legal practice when dealing with nuisances had been to prohibit them. The Alkali Act of 1863 allowed that if at least 95 per cent of the offensive emission were arrested, the remainder, after adequate dilution, might pass to air without serious result. This prudent tolerance gave the chemical industry freedom to develop. Properly to understand the position it is necessary briefly to consider the early days of chemical manufacture in this country.

The chemical industry as we now know it followed the repeal of the salt tax in the early years of the nineteenth century, the first commercially successful alkali works being operated in Liverpool by James Muspratt in the 1820's using the so-called Leblanc process. The alkali industry had its origin in the growing demand for alkalis, the best known of which is sodium carbonate, sold in various forms (washing soda, common soda, soda-ash). Others include caustic soda (sodium hydroxide), potash (potassium carbonate) and caustic potash (potassium hydroxide).

Until towards the end of the eighteenth century sodium carbonate was largely made from the ashes of seaweed, but around this time the French Academy offered a prize for a process to make soda from common salt (sodium chloride). The prize was won by one Nicholas Leblanc, a physician to the Duke of Orleans, the celebrated Philippe Egalité, and who obtained money from his patron to build a works at St. Denis in 1791. Soon afterwards the Duke was sent to the guillotine by the revolutionaries and the works closed. During the subsequent isolation of France supplies of soda failed and Leblanc was given by the Committee of Public Safety the alternatives of joining his late patron or revealing and operating his process. He made the choice many of us would have made in like circumstances, but without much material gain. Failing health and failing means were against him. He finally retired to a workhouse where in distress and misery he took his own life. Some 60 years later his countrymen erected a monument to the unfortunate inventor whose work laid the foundation of the vast chemical industry of to-day. The Leblanc process for the production of soda held its own for a century, but then had to give way to the ammonia-soda process and to the electrolytic process.

The simplified—indeed the much over-simplified—sequence of Leblanc operations is sodium chloride (common salt)—sodium sulphate—sodium sulphide—sodium carbonate (alkali). The main trouble rose from the first operation, the treatment of salt with sulphuric acid. Large volumes of hydrochloric (muriatic) acid gas were evolved and were sent direct to air. So long as manufacture was on a small scale the nuisance was tolerated, but later for example the emissions from Muspratt's works in Liverpool were

Soda Ash Furnaces, about 1860

such that he was compelled to move to Newton Heath, whence he was again expelled. An early remedy was tall chimneys, but the acid fumes did not readily disperse. Initial attempts to wash the gases were a failure, Muspratt, an Irishman, going so far as to declare that not all the waters of Ballyshannon could cope with the acid gas he made. The dry Lancastrian humour seems to have been in existence over a century ago as the area round his works was soon known as "the Spice Islands". A patent of 1839 deserves mention even though nobody took it up. All furnaces and the like were to be sufficiently far from the mainland not to injure vegetation and a ship or flotilla, partly lined with lead, was to be moored on the high seas and works built on it!

The Gossage Tower

The first hope of a break-through occurred in 1836 when Gossage patented the first water-irrigated packed tower, the crude precursor of the modern high efficiency techniques of gas washing as a means for dealing with the hydrochloric acid gas produced. These were progressively introduced into the industry. Their initial efficiency left much to be desired, half to one-third of the acid gases often escaping to air. Complaint continued, more especially as the industry was expanding at a greater rate than the remedies could control. The total amount of acid gas escaping steadily rose despite the attempted gas washing. There was another ugly side also. The recovered acid from the Gossage towers was then largely unwanted and was run into the nearest watercourse. In his Annual Report for 1875 the chief alkali inspector wrote, "The man is living and well known who first killed fish in Sankey Brook, near St. Helens, by sending muriatic (hydrochloric) acid into it."

Destruction of vegetation round the alkali works was abundantly evident and the nuisance could not be ignored. Iron objects of all kinds, locks, window fittings, gutters, railings, etc., rusted away at an alarming rate. It was claimed, probably with some truth, that tools of mechanics were blunted almost at once and that window curtains were destroyed nearly as rapidly as they were hung. Almost every works was in trouble and appreciable sums are known to have been paid as compensation to farmers and others. The annual succession of blighted and destroyed crops must have been a bitter sight to the so-called "alkali farmers" however adequate any compensation.

Select Committee

Public outcry became such that a Select Committee of the House of Lords was set up in 1862 under the chairmanship of the then Earl of Derby to "inquire into the injury resulting from noxious vapours evolved in certain manufacturing processes, and into the state of the law relating thereto". The Committee heard a great deal of evidence both from landowners, farmers, gardeners and medical men on the one hand and from the alkali manufacturers on the other. The industry as a whole adopted a realistic attitude, appreciating that an unco-operative approach was unwise and that on a long term view fair legislation was just as much to their advantage as to that of their neighbours.

The eventual result of their Lordships' inquiries was a Bill introduced later in the year by Lord Stanley of Alderley for "the more effectual condensation of muriatic (hydrochloric) acid gas in alkali works." The Bill became an Act on July 28, 1863, and came into force on January 1, 1864. It defined an alkali works to be "every work for the manufacture of alkali, sulphate of soda, or sulphate of potash, in which muriatic acid gas is evolved". It required that 95 per cent of the muriatic acid gas should be condensed (the evidence before the Lords Committee has established that this was by then a technical possibility), that an inspector and sub-inspectors be appointed and that all alkali works should be registered. The act was known for many years in the industry as Lord Derby's Alkali Act. Parliament seems to have had initially but limited faith in the measure and operation was restricted to an experimental period of five years. In 1868, however, it was agreed that good results had ensued and the Act was made permanent. The general form has been little changed. The aim of legislation since 1863 has in the main been to keep pace with industrial developments by progressively increasing the number of processes under the control of the inspectorate.

Edward, 14th Lord Derby

Although a despoiled countryside, ruined husbandry and a menace to health were obviously the true and sufficient reasons for the Act of 1863 and with the industry as a whole agreeing that such a measure was needful, then as now, purity of motives did not pass entirely unchallenged. In his book "A History of the Chemical Industry in Widnes" (Imperial Chemical Industries, 1950) Dr. D. W. F. Hardie gives an extract from a letter from one alkali manufacturer to another written two days before the Lords Committee began to hear evidence. The extract runs: "Lord Derby has been put up to this entirely by Sir Robt. Gerard, who seeks under the cloak of a public good to facilitate the prosecution of his private claims. This I understand Lord D. does as a slight return to Sir Robt. for the very strong assistance he and his tenantry gave the Conservative Cause in the South Lancashire elections; you will remember, also, how remarkable it was that all the Alkali Trade voted with the Liberal Party, and this may not have been unobserved and commented upon by electioneering agents". Political feeling certainly ran high in those days! Sir Robert Gerard was one of the great landowners in the St. Helens area and his evidence and that of his agent occupied most of the first day's hearing. Dr. Hardie remarks that whether the letter writer "was justified in attributing ulterior motives to Sir Robert must remain a matter for conjecture". It is prudent to follow so wise a lead and in charity to assume, as was presumably the case, that the writer was a grumbler of the orthodox type blowing off steam in the normal manner.

New Alkali, &c., Works Order

Sir Keith Joseph, Minister of Housing and Local Government, has made a new Order, under the Public Health (Smoke Abatement) Act, 1926 and the Clean Air Act, 1956, which has the effect of extending and varying the list of works scheduled under the Alkali &c. Works Regulation Act 1906, and extending the list of noxious and offensive gases mentioned in that Act.

Among the works now scheduled by this Order are certain classes of works connected with the manufacture of acetylene, aldehydes, amines, ammonia, anhydrides, cadmium, calcium carbide, certain chromium compounds, hydrogen cyanide, magnesium, manganese and phosphorus. The newly listed gases are those associated with such works.

The Order also removes from the list of works scheduled under the Act certain processes concerned with the casting of copper alloys and certain ceramic processes.

The Order came into effect on April 1, 1963. As from that date works to which the Order applies are required to be registered, and district Alkali inspectors will be ready to discuss with owners their proposals for applying the best practicable means for preventing the escape of offensive gases, etc.

In the House of Commons, on April 29, the new Alkali &c. Works Order was discussed by means of the curious procedure of moving its annulment in order to welcome it. The motion was moved (and finally withdrawn) by Dr. Barnett Stross (Stoke-on-Trent) and a reply was made by the Parliamentary Secretary to the Ministry of Housing and Local Government, Mr. F. V. Corfield.

A pleasant feature of the debate was a tribute paid by Dr. Stross to the Chief Inspector, Dr. J. S. Carter. "I believe he retires next year", said Dr. Stross. "This complex Order crowns his career and is his swan song. He continued:

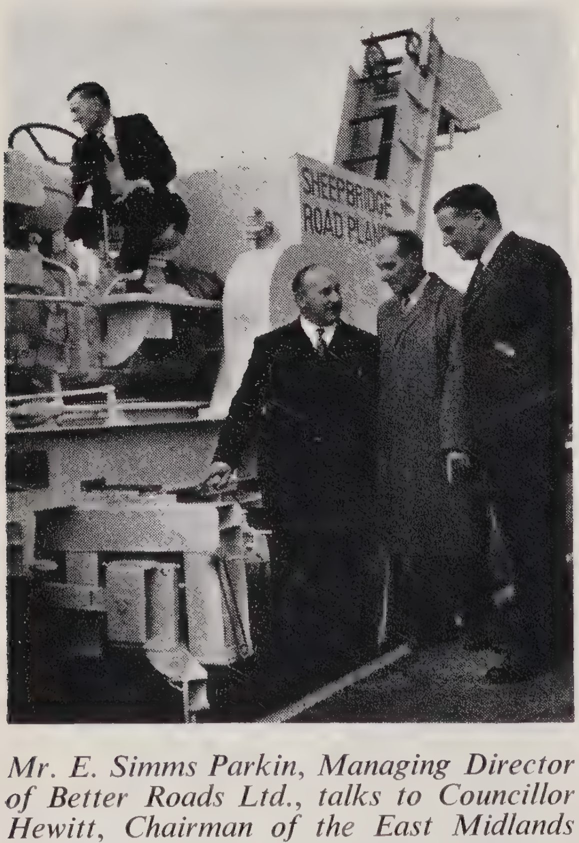
> "In paying tribute to him for what he had been able to do in the area which I represent, we should bear in mind how valuable the inspectorate has been to the countries of the Commonwealth who come to the inspectorate for advice when they are beginning their own new industries. We often criticize our civil servants, but rarely praise them. It is as well to remind ourselves from time to time of the unending and untiring work that these men do on our behalf."

DIVISIONAL NEWS

The **Yorkshire Division,** for its annual general meeting, had Mr. P. D. Coates as its guest speaker. Discussion centred on the desirability of encouraging the installation of closable stoves in smoke control areas, and the following resolution was passed:

> "That this meeting requests that local authorities in Yorkshire be authorized to pay grants under the Clean Air Act in connection with the installation of closable stoves and other appliances capable of satisfactorily burning hard coke."

The **East Midlands Division** met at Alfreton on April 3, by invitation of Better Roads Ltd., to inspect the new E.S.P. Smokeless Road Planing Machine (mentioned and illustrated in our last issue). A demonstration of road planing was given and the delegates were most impressed by the speed and efficiency of the machine, and by the complete absence of smoke emission.



Mr. E. Simms Parkin, Managing Director of Better Roads Ltd., talks to Councillor Hewitt, Chairman of the East Midlands Division, beside the first production model of the Sheepbridge Smokeless Planer.

Lunch was served at the invitation of the Company, and at the general meeting in the afternoon the Managing Director, Mr. E. Simms-Parkin, who had invented and designed the machine, gave an address.

On March 12, the **North West Division** met at Northwich, and heard an address by Mr. A. N. Britten of Imperial Chemical Industries Ltd. on the work done by the company to meet the requirements of the Clean Air Act—which had cost £2,000,000. The talk was so very interesting that it was later suggested, and arrangements have now been made, for Mr. Britten to give a paper on the same subject at the Scarborough Conference in October. The members, after being entertained to lunch, spent the afternoon touring the Winnington works of I.C.I.

The Division also met at Leigh, on May 23, for the purpose of visiting and inspecting the works of British Insulated Callenders Cables Ltd.

The **Scottish Division** held its two-day annual conference in Inverness on May 23 and 24, as we were going to press. Well-attended and optimistic, the conference will be reported in our next issue. The principal speaker was the Rt. Hon. Lord Craigton, Minister of State for Scotland.

Rexco Plants for U.S.A.

An agreement has been signed in London between the National Carbonizing Company Ltd. of Mansfield, and the Natural Resources Corporation of San Francisco, California, giving the American company an exclusive licence for the establishment and operation of Rexco smokeless coal plants in the U.S.A.

The British company has pioneered the Rexco process of low temperature carbonization with increasing success since 1934 and by the end of this year will be producing about 400,000 tons of premium grade Rexco smokeless coal in England and Scotland.

Why do we put up with it?

By Mary Stott

This article, by the Woman's Page Editor of "The Guardian", is reproduced by kind permission from that newspaper, where it was first published under the heading "Women Talking".

A FRIEND came for coffee, and when I took the Rörstrand "Mon Amie" cups out of the china cupboard their rich blue and white was covered in a film of grey. Nothing very unusual; just part of the price we have to pay for living in an industrial city. But this time I felt a sort of nausea, a disgust at being condemned to breathe and to touch and see and smell smog, apparently for the rest of my life.

The crust of black soot on this winter's snow was as vivid a reminder as we could have of what the atmosphere is like that we live in. The snow melted and the rain came and washed the pavements clean and the grass began to turn from grey to green, but the dirt is still with us, in our homes, on our clothes and bodies, and in our lungs. When we wash our curtains and loose covers there is that acrid stink from the blackened water; every neckband is grimy in a day. Dry cleaners can measure in ounces the grit and grime which come from our suits and overcoats.

Why do we put up with it? Generation after generation of women have spent endless hours with mops and pails and scrubbing-brushes, with polish and rags, with vacuums and sweepers and electric polishers and detergents, and a myriad of liquids and pastes and chemicals, trying to check the remorseless tide of dirt.

Why do we accept this monstrous waste of time, energy, money and health as if it were an inescapable law of nature? It is not inescapable. The fact that our industrial revolution was founded on coal has given us a bigger dirt problem to tackle than perhaps any other nation; our islands are small and damp and our prevailing winds are westerly. But there are means to control smoke and fumes. There is legislation to control them. Most local authorities, and, I should think, all public health departments, are willing, and many are anxious, to extend smokeless zones. The reason they are so slow is not their own lethargy and indifference but the lack of the driving force of a vociferously angry, determined public opinion.

Why do people shun the North? Because it is dirty. Why do people move out from the centres of cities and mind so little that they have a hollow heart, a dreary desert uninhabited after dark? Because they are dirty. Why do so many towns and cities cover over the rivers that run through them, rivers that could be a sight to gladden the eyes? Because they are little more than open sewers, black and evil-smelling.

It is fine to let off steam this way, the pent-up fury of 30 years of living among those "dark satanic mills", but like all the problems we know can be solved because they *must*—like the housing of London's homeless, the chaos on the roads, the care of the poor and old—the problem of dirt needs all our wits as well as all our energy and goodwill.

The open hearths burning raw coal cannot be altered overnight; sufficient satisfactory smokeless fuel cannot be supplied overnight. Electricity and gas supplies were often insufficient last winter even though most of us were still thankfully huddling over coal fires. Industries fighting for markets will probably say that the cost of conversion is prohibitive, and whether that is true or not it is certainly true that to have to convert to smokeless fuels, electricity, or gas would certainly be another intolerable burden on the poor and old without help from the community.

But remember the bronchitis, the soot on the snow, the smell of the curtains, and those years you have spent washing and cleaning away the deposits of the smoke pall. This *is* a problem that can be cured because it must.

Questions in Parliament

Sulphur Dioxide Fumes

Mr. Frank Allaun asked the Minister of Housing and Local Government and Minister for Welsh Affairs what steps he is taking through the Alkali Inspectorate to prevent the emission of sulphur dioxide fumes.

Mr. Corfield: In works registered under the Alkali Act in England and Wales the main problem is that of sulphur dioxide from major fuel combustion processes, for example at power stations. No practicable means of preventing sulphur dioxide emissions in such cases has yet been discovered. The Alkali Inspectorate's objective is therefore to secure the use of chimneys high enough to disperse the waste gases. This ensures that when the diluted emission reaches ground level the concentrations of sulphur oxides are below the threshold likely to cause harm.

Mr. Allaun: As no way of preventing these emissions has yet been discovered, will the Joint Parliamentary Secretary take note of the recent statement by Dr. Lessing, a father figure in these matters, that more money should be spent on research into sulphur dioxide emissions? Could not the Government spend a few thousand pounds on that?

Mr. Corfield: My right hon. Friend has had discussions with the gentleman whom the hon. Member has mentioned. I assure the hon. Member that the D.S.I.R. is currently experimenting in these matters and at the moment have a new dry process, but my information is that there is no sign of a breakthrough yet.

Dr. Stross: Has the hon. Gentleman noted that different heavy oils used for these purposes have different percentages of sulphur content and that the content in oil from the Middle East is particularly high? Would he consider whether some method of extracting a portion of the sulphur and putting a limit on the content in these oils could be achieved by regulations?

Mr. Corfield: I understand that the supply of low sulphur oil is simply not adequate for the firing of all the oil-fired power stations, but this is a matter which has been considered and is being considered.

(*April 2, 1963*)

Smoke Control Review

Mr. J. H. Osborn asked the Minister of Housing and Local Government and Minister for Welsh Affairs how far implementation of the smoke control programmes published in Smoke Control (England and Wales) 1962-66 depends on increased production of gas coke suitable for open fires.

Sir K. Joseph: Hitherto in establishing smoke control areas it has been possible to rely on open-fire gas coke being available as the basic domestic replacement for the raw coal previously used. But owing to the rapid technological changes now taking place in the gas industry it is clear that a major increase in the production of gas coke can no longer be expected. This means that at a stage in the programmes varying from place to place additional supplies of open-fire coke may cease to be available to meet the requirements of further smoke control areas. Changes may therefore be needed in current arrangements in order to ensure that progress with smoke control is not impeded. In conjunction with my right hon. Friend the Minister of Power I am instituting an immediate review of these arrangements. The practicability of encouraging greater use of closed and openable stoves, will be among the matters covered by the review. Local authorities will be kept informed of the progress of the work. My right hon. Friend the Secretary of State for Scotland has agreed that in general it would be useful for this review to cover Scotland as well.

(*May 24, 1963*)

A technically most informative series of articles on the Clean Air Act, by J. N. Williams, has been appearing in recent numbers of *Power and Works Engineering*.

The December Smog

Discussed at N.S.C.A. London Meeting

FOLLOWING the Society's Annual General Meeting during the morning of April 17, an open meeting was held, in conjunction with the South East Division, in the afternoon, at the Royal Commonwealth Society. There were four speakers: Dr. A. G. Forsdyke, Assistant Director, Meteorological Office; Dr. S. R. Craxford, Warren Spring Laboratory, Dr. P. J. Lawther, Director of the Air Pollution Research Unit, Medical Research Council; and Mr. G. B. Courtier, Public Health Department, London County Council.

The Chairman at the meeting was the newly elected President, Dr. Albert Parker. In introducing the speakers he described the purpose of the meeting and emphasized the importance of a careful analytical survey of the 1962 smog. The study of evidence would help in finding out the primary pollutants and also answer those who might have preconceived ideas. Dr. Parker called for the removal of pollution by all practicable steps and expressed the hope that as a result of research and development we would be able to move further ahead in the future.

The addresses given by the four speakers were of an informal nature, and not written papers. A number of slides were shown, and the more important diagrams are reproduced below, with a summary of the four addresses.

Dr. A. G. Forsdyke

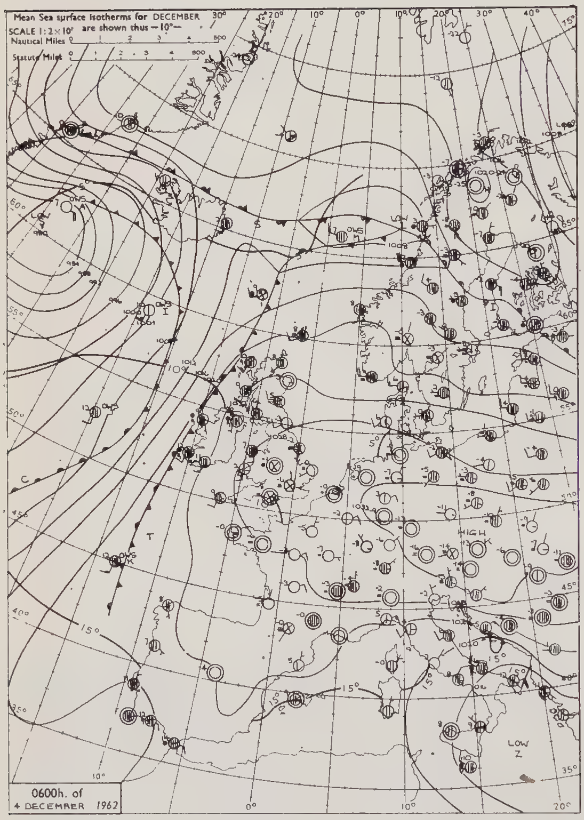
Dr. Forsdyke then spoke on the meteorological aspects of fog. It was due, he reminded the audience, to the condensation of water vapour in the atmosphere and was, in essence, cloud at a low level. Smoke and other pollutants were merely an additional complication from his point of view as fogs occurred whether they were present in the atmosphere or not. The prevailing weather conditions in early

Speakers and Chairman at the London Meeting. From the left: Dr. S. R. Craxford, Dr. A. G. Forsdyke, Dr. Albert Parker, Dr. P. J. Lawther, Mr. G. B. Courtier

Weather Charts for December 1, 4 and 7, 1962

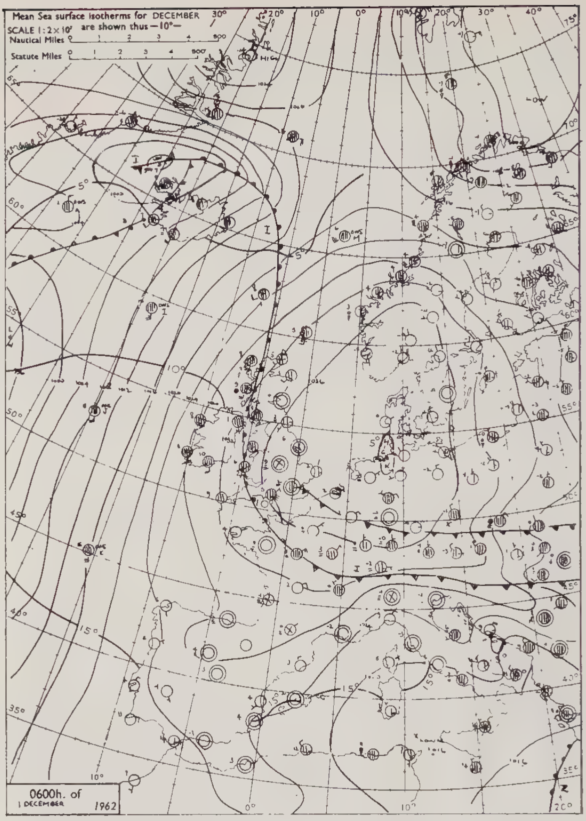
The continuous lines are isobars; closely spaced isobars accompany strong winds, widely spaced isobars light winds or calm.

Surface wind directions are shown by arrows, and the speeds are indicated by the number of feathers; a calm is indicated by a double circle. The figure to the upper left of the station circle is the temperature in °C.


Mean Sea surface isotherms for DECEMBER are shown thus —10°—
SCALE 1:2×10⁷
Nautical Miles
Statute Miles
HIGH
LOW
0600h. of 4 DECEMBER 1962

December 4: Anticyclone centred over Central Europe but now covers most of England where winds are calm or light. Temperatures in S.E. England well below freezing. Fog extensive

December 7: Centre of anticyclone still over Central Europe but more isobars cross England and a pressure gradient now exists in the S.E. Winds still calm or light at the surface but isobars indicate appreciable S.W. winds a few hundred feet above surface and the resulting turbulence helped in dispersing the fog. Temperatures in S.E. England higher than on December 4 but still below freezing


Mean Sea surface isotherms for DECEMBER are shown thus —10°—
SCALE 1:2×10⁷
Nautical Miles
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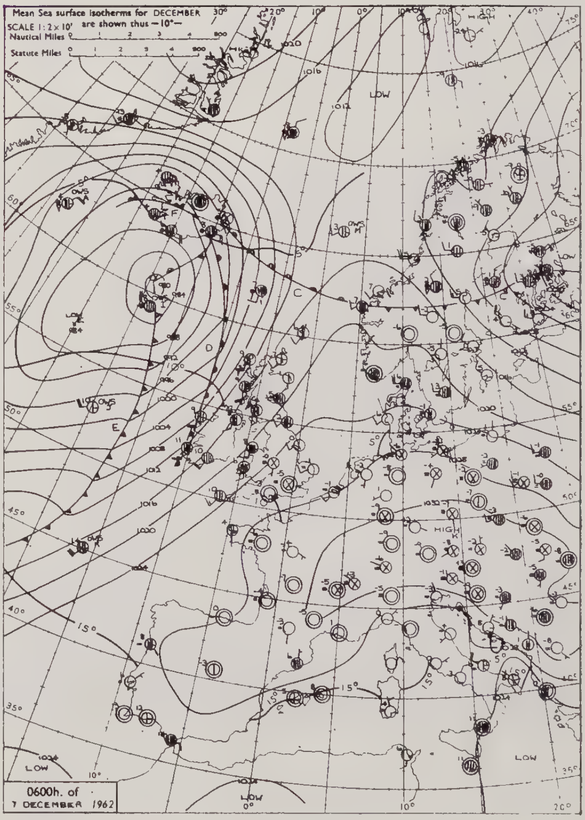
0600h. of 1 DECEMBER 1962

December 1: Anticyclone centred over Denmark extends over E. and S.E. England where winds are calm or light; moderate winds elsewhere in British Isles. Temperatures in S.E. England a few degrees above freezing. Patches of early morning fog, which dispersed during the day


Mean Sea surface isotherms for DECEMBER are shown thus —10°—
SCALE 1:2×10⁷
Nautical Miles
Statute Miles
HIGH
LOW
0600h. of 7 DECEMBER 1962

December 1962 were described by the speaker and the imprisoning effect of an inversion of temperature was emphasized in detail.

Dr. Forsdyke then showed three weather charts to illustrate the build up of these conditions as the anticyclone responsible for them centred over Eastern England and Europe. The role of the temperature inversion as a contributory factor could be clearly seen when comparisons were made on the succeeding days of the fog, but throughout most of its duration air temperature in the fog was below freezing point, producing some spectacular rime effects whenever fog particles came into contact with a solid object or vegetation. On top of the Chilterns between Henley and Oxford on December 5, the weather was sunny and spring-like, contrasting spectacularly with the frost and rime at lower levels.

Dr. S. R. Craxford

Dr. Craxford reminded listeners of the duration, height and intensity of the fog in a vivid dimensional introduction to his subject matter which he proceeded to illustrate with a series of slides. These showed the concentration of smoke and sulphur dioxide as recorded in many parts of the Metropolitan area.

On a normal winter day in London the concentration of both these pollutants was something like 300 or 400 microgrammes per cubic metre and this was the key figure to bear in mind in relation to recordings taken during the period of the fog.

At Islington pollutions of 3,000, 4,000 or 5,000 microgrammes per cubic metre, serious enough in themselves, were exceeded on some sites in London. Although not representative they had to bear in mind that people had to live and walk around in those insufferable conditions.

Unfortunately, he said, the fog, as shown by the diagrams, upset the normal pattern of peak in the early evening and peak just before mid-day. Something else was affecting the

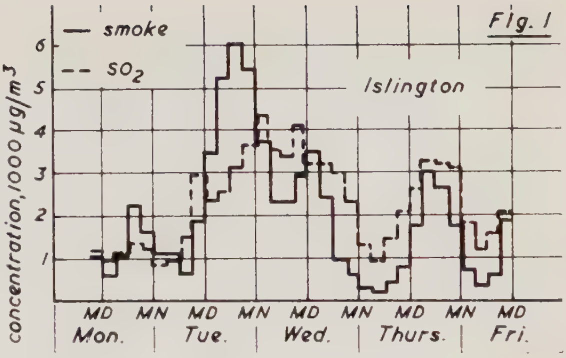


Fig. 1

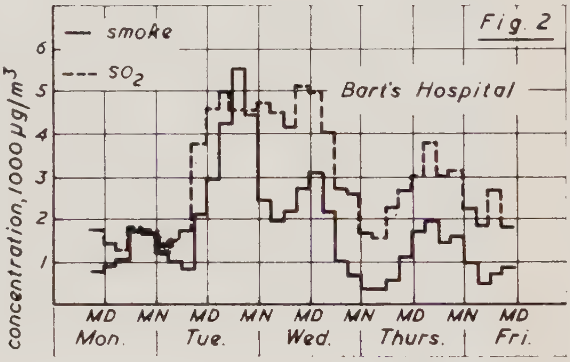


Fig. 2

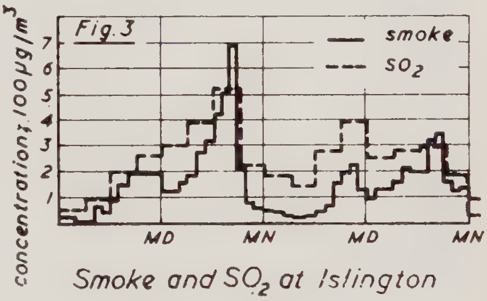


Fig. 3

Smoke and SO_2 at Islington

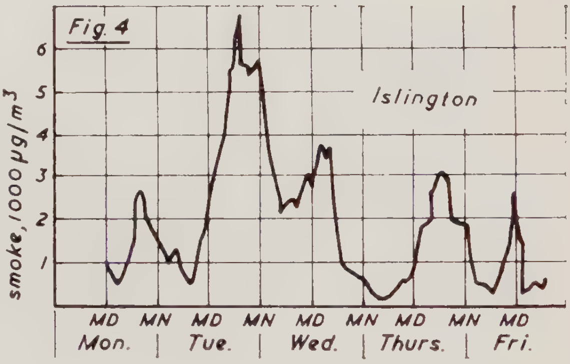


Fig. 4

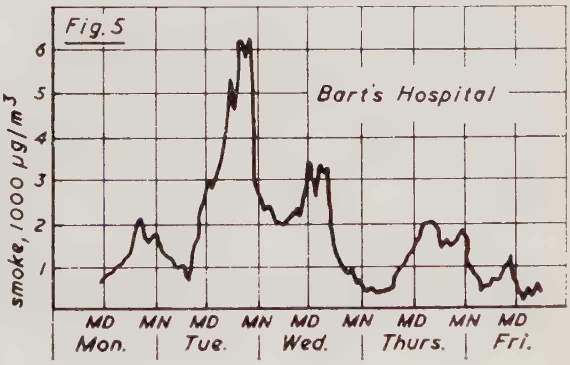


Fig. 5

pollution on these fog days, changes in meteorological conditions etc. It just wasn't taking the normal day's picture and multiplying it by ten—the peaks were sometimes in the wrong place, sulphur dioxide peaks being lower than smoke and coming later in the day.

A diagram from St. Bartholomew's Hospital showed precisely the same trend but with less smoke and rather more sulphur dioxide. Although in a smokeless zone one could see that an awful lot of smoke had been getting in, and the local production of sulphur dioxide, possibly the production of the central heating plants, was making itself felt.

Dr. Craxford then showed the results for smoke alone, measured hourly at a number of sites in London, and pointed out the irregular pattern of peak pollution they revealed. As the slides had gone through, he said, one might have expected some pattern of uniformity to emerge but it hadn't. One overriding conclusion could be formed: that in London the fog was very patchy and different things were happening in different districts.

There was no perceptible wholeness and even in central districts such as Westminster and Islington much variation in the pattern and type of pollution was apparent. Dr. Craxford next summed up all the local authorities' daily measurements with the assistance of four slides, drawing attention to the apparent mobility of peak concentrations of smoke. Central London, he said, was consistently and solidly polluted while in the outskirts they could find no explanation for the variable pattern of high pollution in wind direction or the elevation above river level.

The same picture emerged for sulphur dioxide though its concentration could be high much further out from the centre than in the case of smoke—a phenomenon the speaker could not explain. As succeeding slides emphasized the variable and inconsistent pattern of both smoke and SO_2 pollution, Dr. Craxford made the cryptic comment that confusion had become more confounded as one inconsistent pattern succeeded another. He had given the results and challenged his audience to think out an explanation for the irregular pattern of pollution as the solution had eluded him.

Then followed information about the concentrations of sulphuric acid

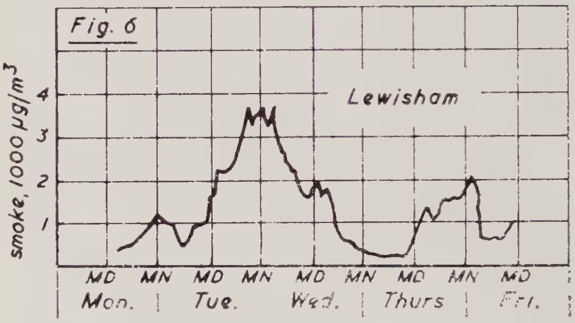


Fig. 6

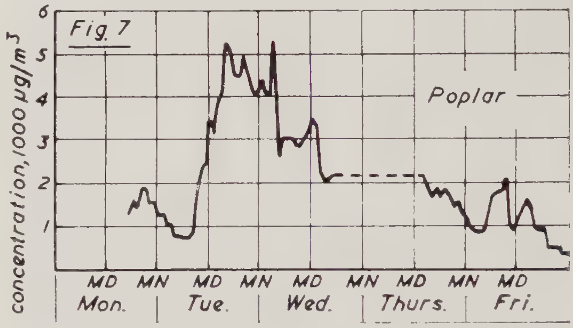


Fig. 7

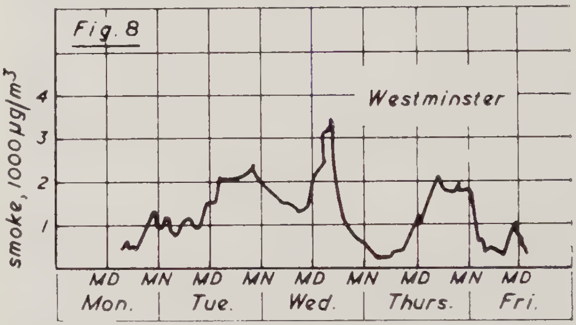


Fig. 8

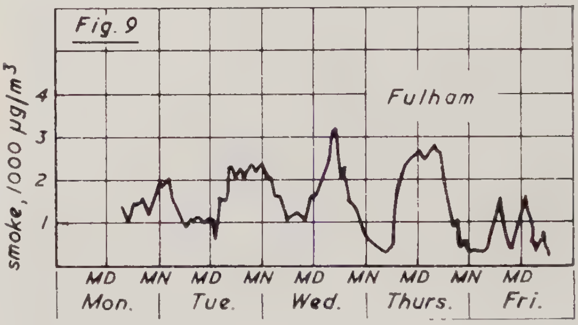


Fig. 9

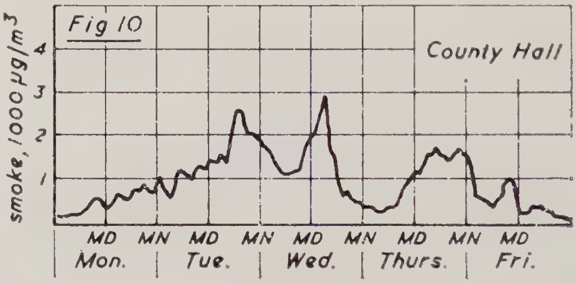


Fig 10

droplets at Barts and at Islington, which had risen to 20 times as high as normal. On the Sunday prior to the fog there was a normal reading of 20 microgrammes per cubic metre; a few days later this rose to its worst, a peak of 700 microgrammes per cubic metre. Oxides of nitrogen did the same thing, rising by about 20 times to 400 microgrammes per cubic metre.

Dr. Craxford declined to compare the detailed smoke situation with that which had pertained in 1952. The smoke measurements in 1952 were not reliable owing to the saturation of smoke filters. However, for the whole of London the position was clear, about 37 per cent less smoke had been emitted over the whole of the area in 1962 than in 1952 so assuming similar meteorological conditions smoke pollution was 37 per cent less. Sulphur dioxide concentrations were just about the same as in 1952 and as there was only a small increase in emission since 1952 this was evidence that the meteorological conditions were in fact of about the same severity in the two incidents. Dr. Craxford concluded by referring to the work on the fog that Mrs. Weatherley and Mr. Davis of the Warren Spring Laboratory had both done and on which his present talk was based. As a consequence, he said, they would be better able to answer any awkward questions.

Dr. P. J. Lawther

Dr. Lawther referred to the importance of his subject justifying extreme brevity. It would not, he said, be diluted with technical details and his failure to bring pictures would ensure the rapt attention of his audience.

In the December fog of 1952 it was estimated that about 4,000 people died of air pollution in the Greater London

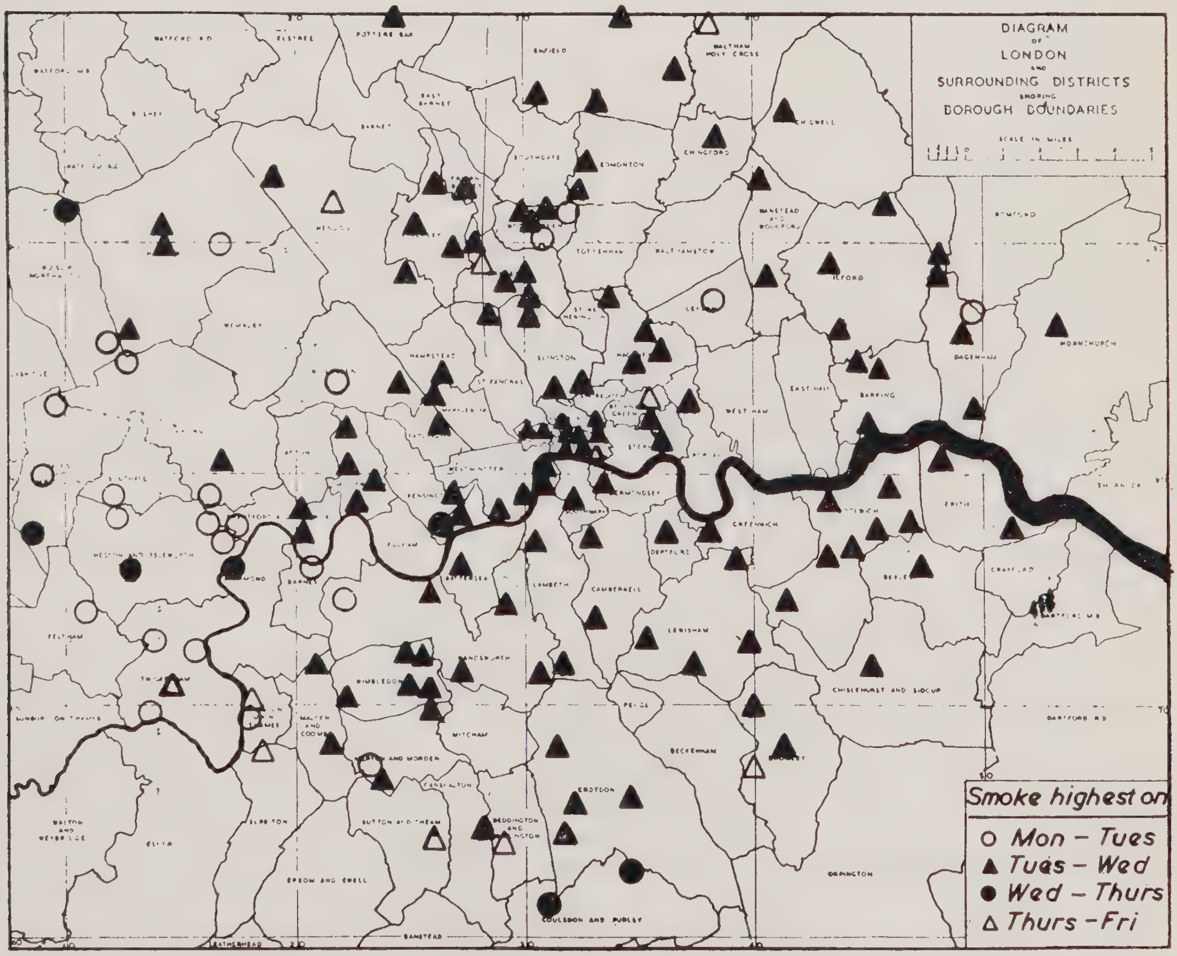


Fig. 11. Worst days—Smoke

area. There were as yet no official figures for 1962 because further work had to be done on them. However, it could be said that it looked as though about 750 people lost their lives because of air pollution in Greater London in the episode in December 1962.

Doctors could not be more precise because of the factors involved in calculating excess mortality. The Registrar-General did not tell them the actual day on which people die, only the week in which the death had been registered. Hence one was conscious of both inadequacy and crudeness when trying to ascertain the true death-rate.

Dr. Lawther reminded the meeting that winter was a time when the death-rate mounted. They had to judge how high mortality jumped during the fog and the accuracy of one's guess depends upon how carefully one calculated the number of people who might have died had there been no smog, fog air pollution or any other act of God or man.

One had to take into account that deaths occur among people who were "susceptible" in an incident of this kind and relate the excess mortality to a population of 8½ million people. In 1952 nobody rushed out into the street crying "Woe, woe, killer smog strikes again" but they did notice that after it, it took a long time to get their relatives buried and also that the obituary notice columns in the newspapers were getting longer and longer.

"I am very eager," said Dr. Lawther "to prevent the Society falling into a terrible error. In 1952 the estimate of mortality was 4,000; in 1962 our rough

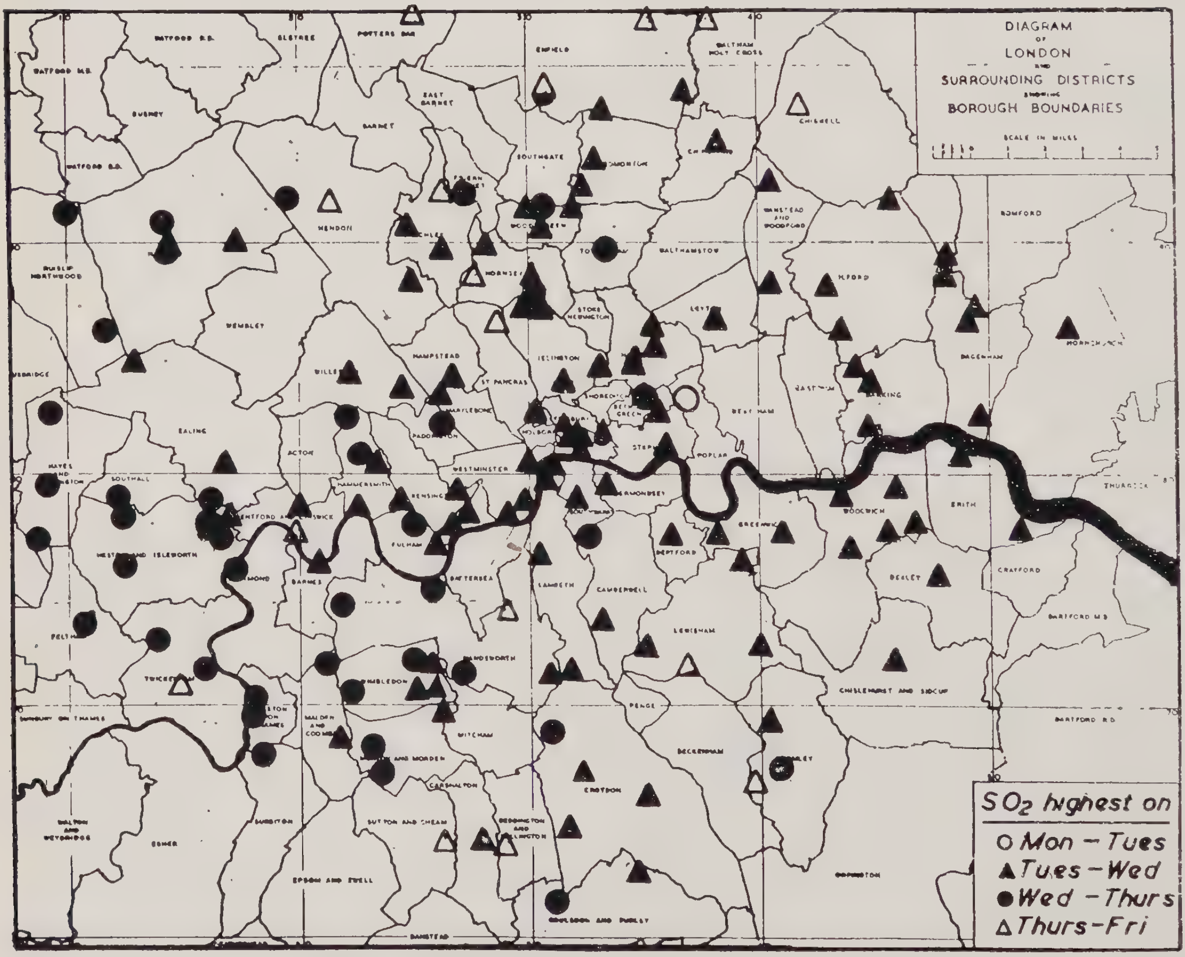


Fig. 12 (above) Worst days—SO_2

Fig. 13 (opposite, top) Dec. 4-5 Smoke Concentrations

Fig. 14 (opposite, bottom) Dec. 4-5 Smoke Zones

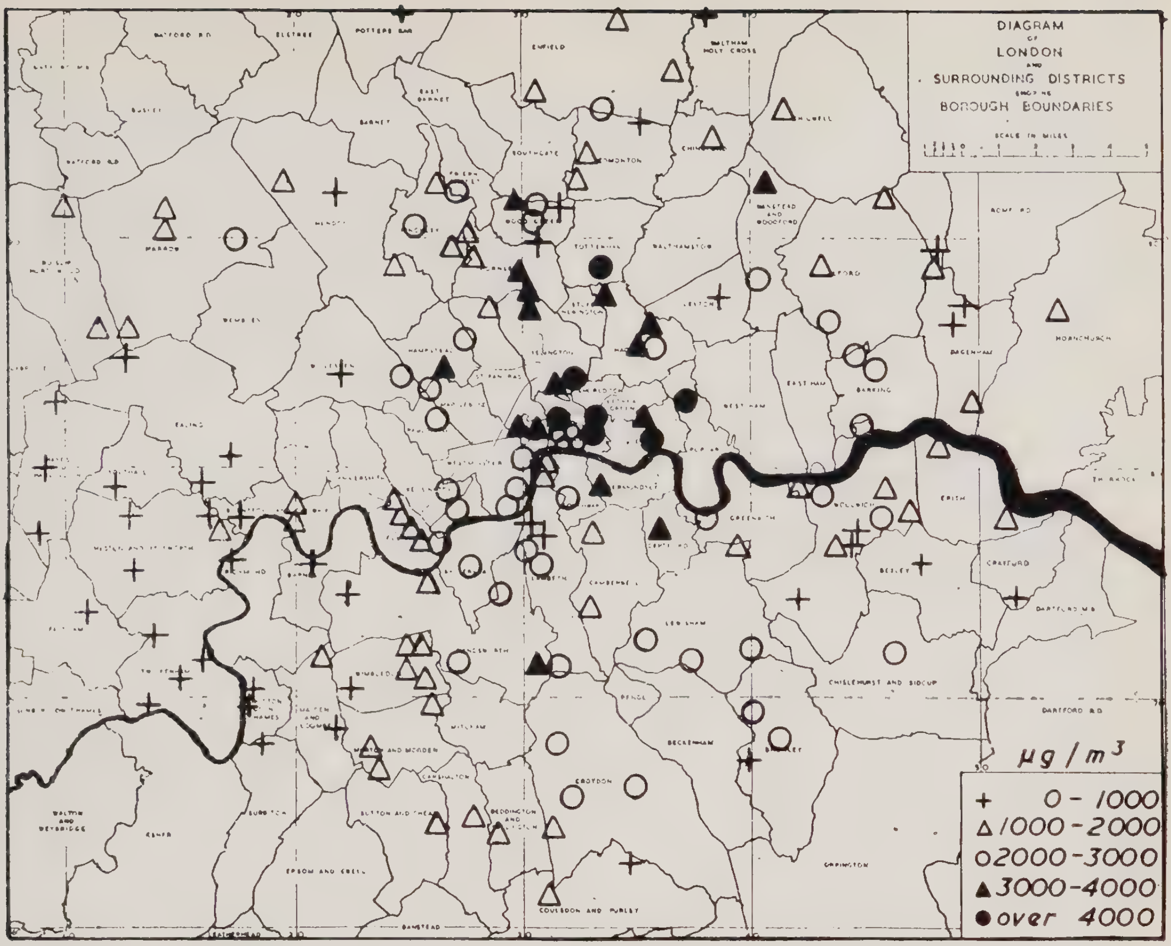
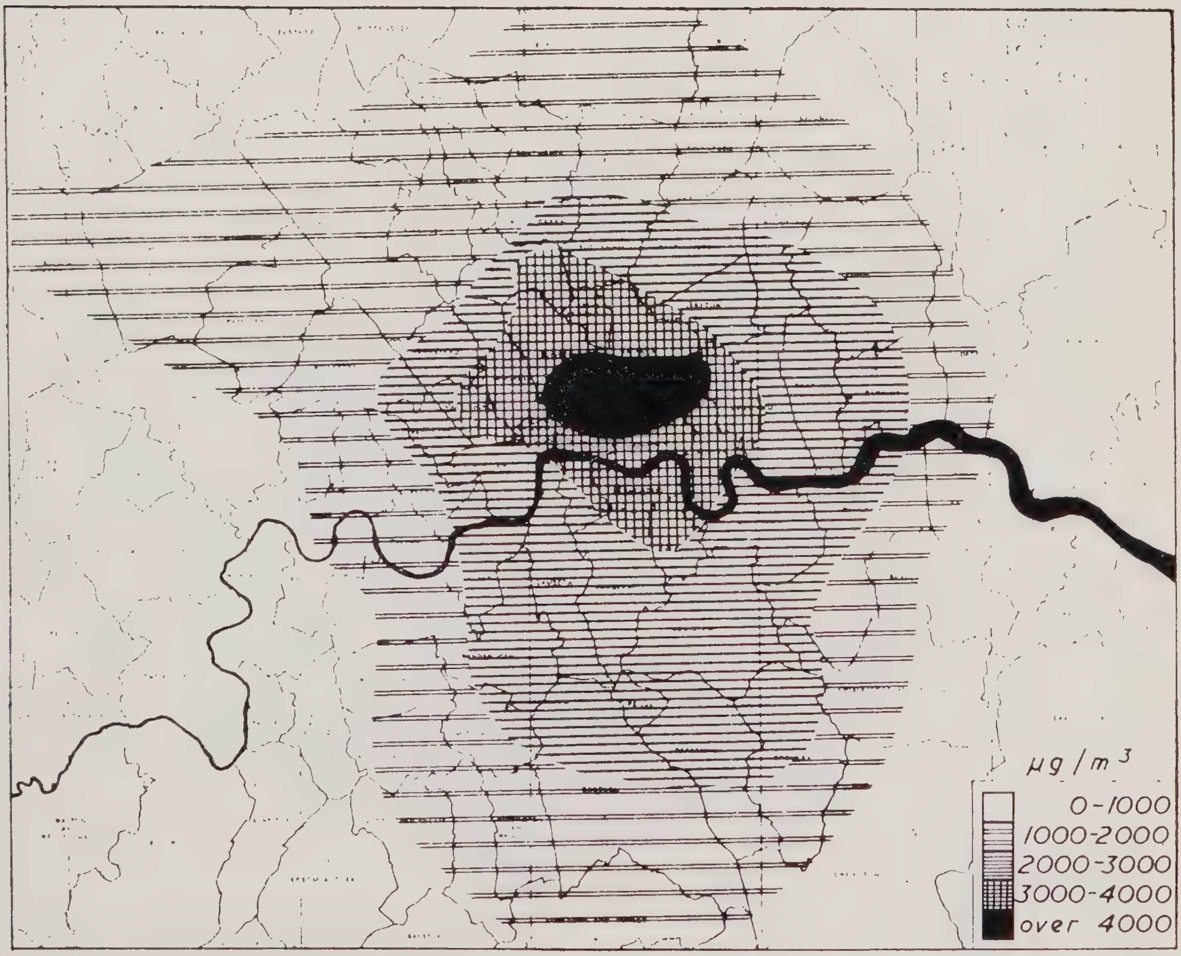


DIAGRAM OF LONDON AND SURROUNDING DISTRICTS SHOWING BOROUGH BOUNDARIES
SCALE IN MILES
µg / m³
+ 0 - 1000
△ 1000 - 2000
○ 2000 - 3000
▲ 3000 - 4000
● over 4000


µg / m³
0-1000
1000-2000
2000-3000
3000-4000
over 4000

estimate is about 750. Dr. Craxford has told us that beyond any shadow of doubt the two incidents were virtually the same in many respects, except that there was less smoke in 1962. People on all sides have been saying that we had less than a quarter of the number of deaths because the smoke was less. Although we all feel intuitively that the reduction in mortality *was* because of the reduction in smoke we must beware of falling into the trap of making assumptions that cannot be substantiated in subsequent inquiry".

Dr. Lawther then described the relationship between statistical compilation in respect of air pollution and the recording of road deaths over comparatively short periods. One could perceive a trend and yet not have sufficient evidence to form a definite conclusion.

They had to look again at the tiresome business of what did kill people in fog incidents, as in general they were the people in rather bad shape. Air pollution combined with the stress of coughing and the stress of getting a spasm of the bronchial tubes provided the last straw. In both incidents there was significance in the fact that deaths from cardio-vascular disease, from coronary thrombosis, from haemorrhage of the brain and from heart failure had been higher. Amongst a population of 8½ million people there are many who could not stand the additional burden of four or five days of coughing and bronchial spasm.

The factor of non-specific stress must be considered in relation with what was in the air; mortality rates depended not only on the kind of stick used to beat the customer but also the shape he was in when one set about beating him.

After describing the importance of morbidity factors and the balm-like effect of a fairly good summer and autumn, Dr. Lawther enjoined the meeting to recognize that they could only assess the mortal effects of any particular smog if they had really adequate knowledge of what had gone before. The message he was trying to communicate was that they had to be very cautious in ascribing any difference in mortality to any difference in the pollution of the air. They should question the effect of press publicity especially when a rather startling headline made it appear that the killer smog was hardly less to be feared than the bubonic plague. Some people had been so terrified that they had given up the struggle for existence. However, the issuing of commonsense information by the Press and T.V. might have produced a fall in mortality. It had at least made the smog mask a sort of status symbol. The empirical use of ammonia to neutralize acid had been a prudent action and might have been a factor in lessening mortality.

Dr. Lawther concluded with a warning that they should be thankful that mortality in the last episode had been so much less than in 1952 and he hoped that it *had* been due to the progress in cleaning the air, which would serve as an encouragement to accelerate the programme. However, the good name of the Society would be in jeopardy if after having loosely attributed the reduced mortality to the reduction in smoke, the next smog produced a death roll of six thousand! It did terrify him that they could gain a reputation for not having spoken wisely. The wise attitude was really one of cautious optimism.

G. B. Courtier

Mr. Courtier spoke as a Londoner who had breathed his fair share of smog, a four letter word coined by an early member of the Society. That was his qualification for filling in any cracks left by the three previous speakers. He applauded the cautious tone of the winter issue of *Smokeless Air* with its warning that much more progress towards clean air must be made before the killing smog was no more. We had spoken of the Devil and

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Opposite, top: Fig. 15. Dec. 4-5 SO_2 concentrations

Bottom: Fig. 16. Dec. 4-5 SO_2 zones

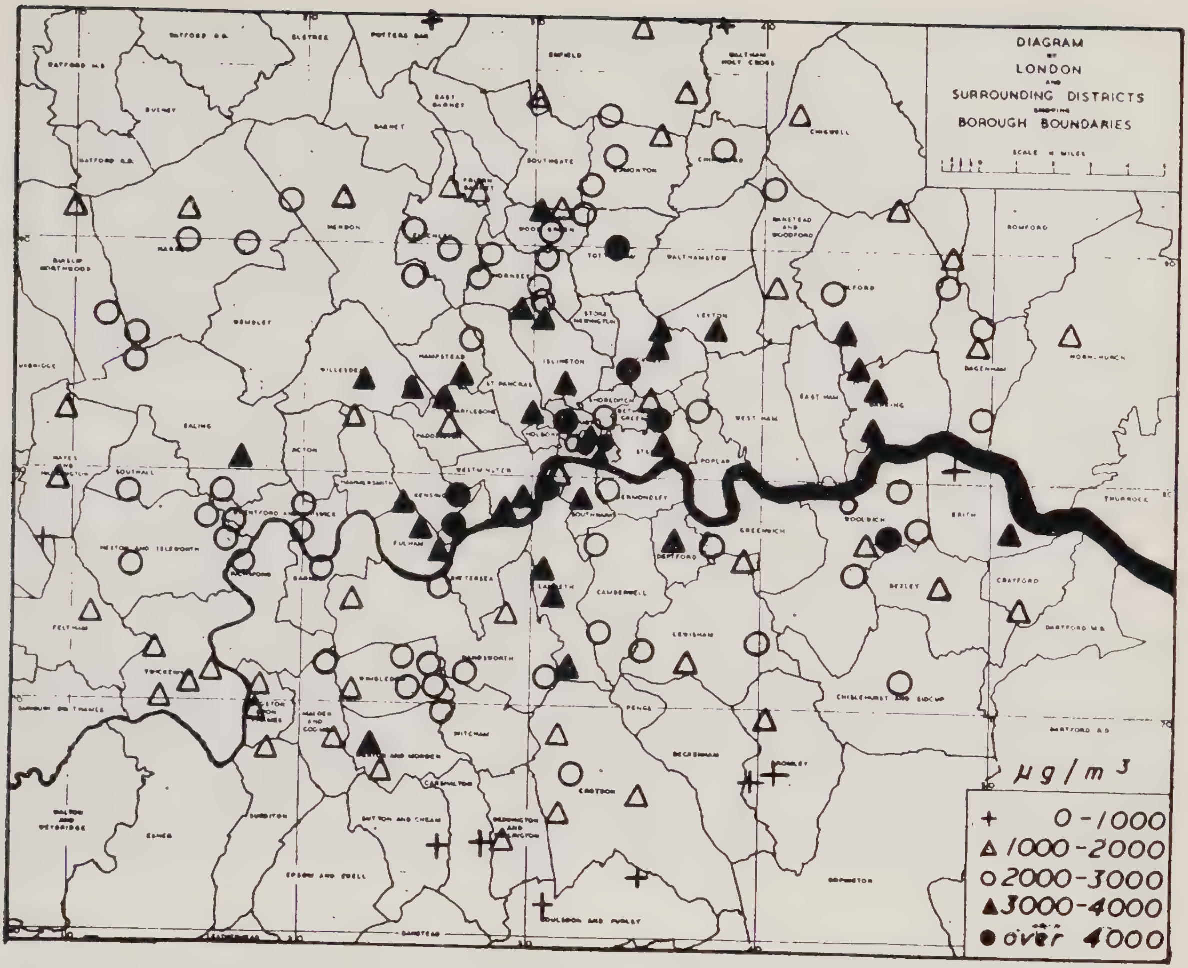
DIAGRAM OF LONDON AND SURROUNDING DISTRICTS SHOWING BOROUGH BOUNDARIES
SCALE IN MILES
µg/m³
+ 0-1000
△ 1000-2000
○ 2000-3000
▲ 3000-4000
● over 4000
ENFIELD
SOUTHGATE
EDMONTON
TOTTENHAM
WALTHAMSTOW
HORNSEY
HENDON
WILLESDEN
HAMPSTEAD
ST PANCRAS
ISLINGTON
SHOREDITCH
HOLBORN
WESTMINSTER
PADDINGTON
KENSINGTON
FULHAM
HAMMERSMITH
EALING
ACTON
SOUTHALL
BATTERSEA
LAMBETH
SOUTHWARK
BERMONDSEY
CAMBERWELL
DEPTFORD
GREENWICH
WOOLWICH
LEWISHAM
WANDSWORTH
WIMBLEDON
MITCHAM
CROYDON
BECKENHAM
PENGE
BROMLEY
BEXLEY
ERITH
CRAYFORD
DARTFORD R.D.
ORPINGTON
CHISLEHURST AND SIDCUP
ROMFORD
DAGENHAM
BARKING
EAST HAM
WEST HAM
LEYTON
ILFORD
CHIGWELL
HORNCHURCH
THURROCK
POPLAR
SURBITON
ESHER
EPSOM AND EWELL
SUTTON AND CHEAM
CARSHALTON
COULSDON AND PURLEY
BANSTEAD
TWICKENHAM
FELTHAM
HESTON AND ISLEWORTH
WATFORD R.D.
BUSHEY
ELSTREE
POTTERS BAR
BARNET
EAST BARNET

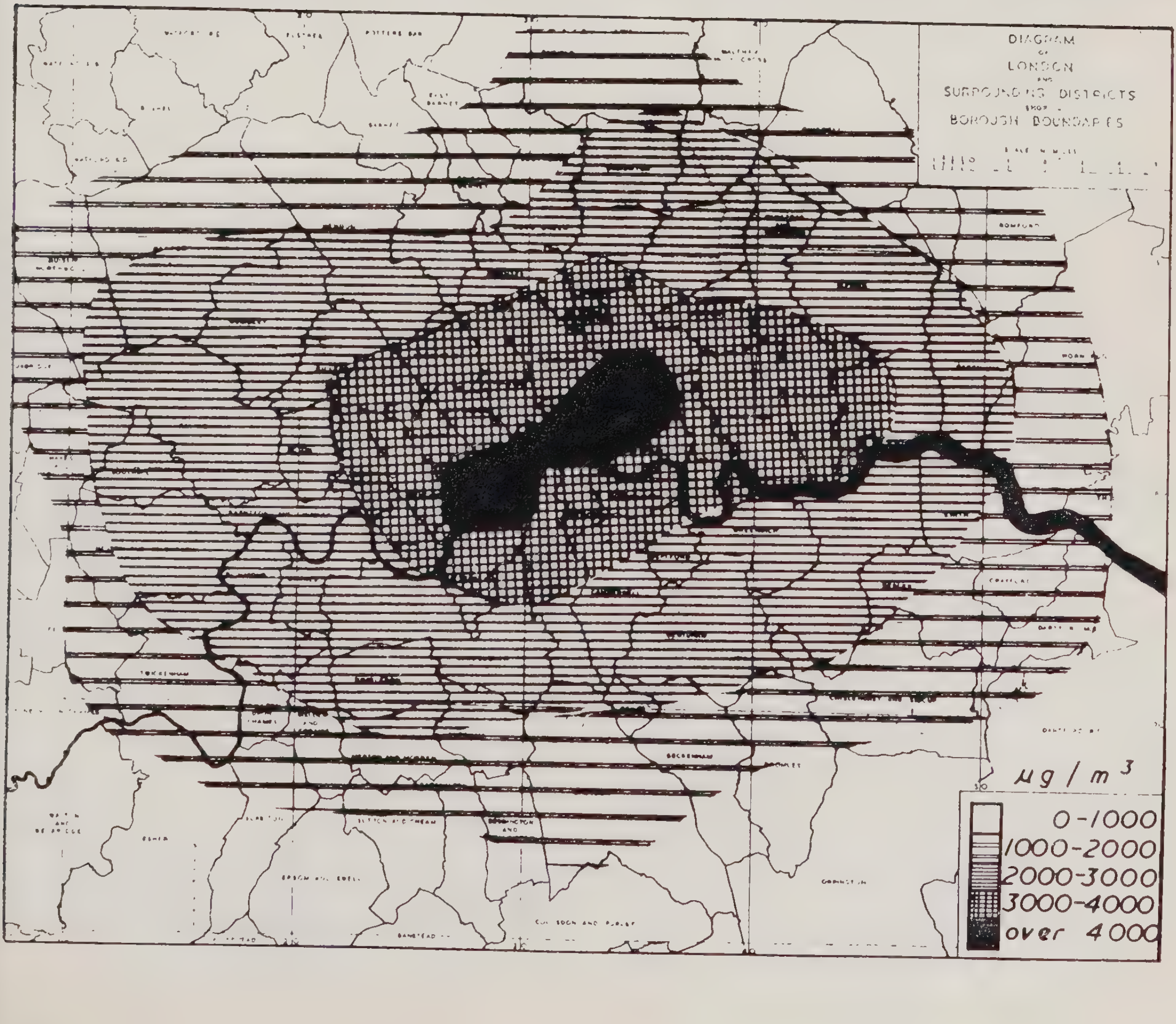
DIAGRAM OF LONDON AND SURROUNDING DISTRICTS SHOWING BOROUGH BOUNDARIES
SCALE IN MILES
µg/m³
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BECKENHAM
ESHER
EPSOM AND EWELL
SUTTON AND CHEAM
COULSDON AND PURLEY
BANSTEAD
ORPINGTON
CHISLEHURST AND SIDCUP
POTTERS BAR
ELSTREE

there it was again—an unwelcome visitation, dirty, damaging, and dangerous. People had asked why they had to put up with the Clean Air Act as well as the fog! Statements had been made at the time on slender evidence but now we had more facts and could make more reliable assessments.

With the help of slides from County Hall*, Mr. Courtier was able to show that London's air was getting cleaner as the Metropolitan Boroughs established smoke control areas. They provided evidence that our defences against exceptional fog had improved but were not yet impregnable.

Systematic visual observation by an enthusiast on the staff revealed that over a period of thirty years the visibility in Central London had improved. Average winter visibility had extended from one to three miles during this period and ranged nowadays from about a hundred yards on a really foggy day to five or six miles on a good day.

The progress towards clean air in the London area was varied and largely conditioned by the number of premises to the acre. It could be that this patchiness and movement of smoke provided a partial explanation to Dr. Craxford's problem of why some testing points are so different from others. Some boroughs need not feel too ashamed as they viewed the slides showing progress towards smoke control, but their density of population was so high that with a quarter of their premises in smoke control areas there still remained a large black region.

In making comparisons with 1952 they had to recognize that during the recent smog everybody was piling on the heat whether drawing on power stations, gas works or their own grates. In 1952 there wasn't so much fuel about and perhaps people were less able to afford it. He recalled that on this occasion unlike 1952 there was little blackening of brass and silver work and reminded the meeting of the voluntary movement towards cleaner forms of heating and cooking.

One slide that graphically illustrated the filthy nature of smog showed the typical quantity of dirt that one person breathed in 24 hours during the December fog compared with the same period of time in 1952. A 1962 halfpenny laid alongside simplified the task of estimating the bulk quantity and Mr. Courtier recalled coughing such dirt up for a good many days after the event.

The last slide illustrated the mortality rate in the County of London. The zig-zagging line revealed a marked upward tendency as the smog developed and the figures climbed right outside the bounds of statistical variation. One must not say fog caused the excess deaths, because it might be something associated with fog, such as cold weather, said the speaker, but the more recent cold spell had shown such an idea didn't hold water, so it really was the fog.

On this emphatic note Mr. Courtier concluded his address and the chairman invited questions and comment from the audience.

Glasgow's Clean Air Plans

Glasgow Corporation plans to make the city smokeless by 1970. Under this second five-year plan, 180,000 houses will require to replace fireplaces to burn smokeless fuel. The cost will be £8 million, of which the Corporation will pay £2·5 million, householders £2·5 million and the Government £3 million.

The Corporation is increasing its smoke-control staff and is to have discussions with the South of Scotland Electricity Board, the Scottish Gas Board and the Government departments concerned, as well as with the solid fuel trade concerns, to secure maximum co-operation on the completion of this big programme.

According to *Science Digest* (Chicago), United States physicians report that in 1962 there were 1,600,000 cases in which air pollution figured as a causative factor. In 1958 the total was 1,200,000.

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* See report in our last issue, p. 183.

Air Pollution from Road Vehicles

A Survey of its Nature and Causes

by

*A. T. Wilford, B.Sc., A.R.C.S, F.R.I.C., C.I.Mech.E., F.Inst.Pet.**

THAT road vehicles—cars, taxis, buses, vans and lorries—whether powered by petrol or diesel type engines, are a source of pollution of the atmosphere is a penalty that our present civilization has to pay for its ever increasing demand for mechanical transport. Moreover, although the internal combustion engine is the most efficient source of power yet available, it would be unrealistic to suggest that engines could ever be designed and operated such that perfect combustion of the fuel was effected under all, or indeed, any conditions of running. The public is however entitled to expect that any harmful or toxic constituents present in the exhaust emission should be minimized and that the vehicles should in other respects be free from objection—a remark which does not apply only to the exhaust emission.

Internal combustion engines in road vehicles run on fuels derived from petroleum. These fuels, whether petrol, or the gas oil fraction (technically known as derv) used in high speed diesel engines, consist essentially of compounds of carbon and hydrogen, i.e. hydrocarbons, and if completely burned during combustion in the engine would yield an exhaust emission consisting of carbon dioxide, water vapour, atmospheric nitrogen and very small amounts of nitrogen oxides, together with any excess of oxygen not required in the combustion process. Carbon dioxide is not usually regarded as an atmospheric pollutant in that it is a constituent of normal air to the extent of about 0·04 per cent; it only becomes dangerous if generated in a sufficient concentration in a confined space when it acts as an asphixiant.

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* Formerly Director of Research, London Transport, and a Member of the Society's Technical Committee.

Petroleum fuels do not however consist solely of pure hydrocarbons. Derv fuel for example contains from 0·1 to 1·0 per cent of sulphur, according to its source of origin; petrol has a very much lower sulphur content, but on the other hand contains both lead and phosphorus compounds, present as anti-knock and oxidation—inhibiting additives respectively. Even under conditions of perfect combustion, the exhaust emission will contain various constituents other than those already mentioned. It has also to be remembered that petrol is volatile and that pollution of the atmosphere will arise as a result of evaporation from the fuel tank and carburettor, and also during the course of re-fuelling. Added to these is the emission of engine "blow-by" gases and lubricant fumes during normal breathing of the engine crankcase. These various sources of pollution are not perhaps of much significance in this country (though they constitute a wastage of fuel) but are of considerable importance in California where, together with oxides of nitrogen, they are concerned in the series of photochemical reactions which lead to the formation of the Los Angeles "smog".

In recent years in Great Britain, public attention has tended to concentrate upon smoke emission from diesel-engined vehicles to the extent that such vehicles have been regarded in some quarters as a major source of atmospheric pollution: the domestic chimney and the comparatively invisible exhaust emission from petrol-driven vehicles have been conveniently forgotten. But it is still a fact that despite the marked improvement which has come about as a consequence of the Clean Air Act, coal smoke is by far the greatest contribution to the pollution of the air in our cities and towns. On the other hand, it is a source of pollution which is decreasing and will continue to do so as further smokeless zones are created and more ample supplies of suitable solid fuels become available. But the number of road vehicles is increasing at an accelerating rate and in time to come it may well be that pollution of the atmosphere due to this cause—more particularly in busy traffic centres and in road tunnels—will be of more real significance than it is today.

Mention has already been made of the tendency to regard diesel engines rather than petrol engines as the more serious source of air pollution; that such a conclusion is not warranted will become evident from the following brief description of the combustion process in the respective types of engine.

The Combustion Process

An internal combustion engine, whatever its type, is essentially a device for converting into mechanical energy part of the heat energy released when fuels undergo combustion in the presence of air. This conversion depends upon the fact that when heated a gas expands, or if prevented from doing so, develops an increased pressure; the gaseous expansion or the pressure rise can then be made to perform useful work in an engine. Apart from the smaller vehicles such as motor cycles, the great majority of vehicles on the roads in Great Britain are powered by multi-cylinder engines operating on what is known as a four-stroke cycle. The initial intake, or suction, stroke in which a charge of air (with, or without fuel) is introduced into the cylinder is followed by a compression stroke, towards the end of which ignition of the fuel-air mixture takes place. Expansion of the heated gases leads to the third, or working stroke, after which the piston returns to its initial position and in so doing scavenges the combustion products from the cylinder, thus enabling the whole cycle to be repeated.

With the petrol engine, the fuel is normally introduced into the intake air by means of a carburettor. This mixture is then compressed to about one-eighth of its original volume and is ignited by a spark discharge just before the piston reaches the top of its stroke. Satisfactory combustion of petrol vapour in air can only be achieved within a limited range of mixture compositions, there being both lower and upper limits beyond which the rate of burning becomes too slow to meet the demands of engine operation. In practice, the weakest mixture that can be burned contains about 85 per cent of the fuel required to combine completely with the oxygen present in the available air. But for the upper limit of combustibility, the mixture can contain a quantity of fuel considerably in excess of the "chemically correct" mixture, and in fact, a somewhat over-rich mixture is necessary in order to achieve the rated power output of a petrol engine. In these circumstances, complete combustion of the fuel is quite impossible and the exhaust products will inevitably contain an appreciable proportion of carbon monoxide and smaller amounts of other constituents, representing partially burnt, or perhaps unburnt, fuel. Free carbon, which would lead to a smoky exhaust emission is seldom produced unless the fuel-air mixture is grossly over-rich, as for example, when running in choke.

The Diesel Process

In contrast with the petrol, or spark-ignition engine, the first stroke of the cycle in a diesel engine takes in a charge of air only, which is then compressed to about one-seventeenth of its original volume. Shortly before the piston reaches the top of this compression stroke, fuel is squirted very rapidly into the cylinder by means of a small high-pressure pump—technically known as an injector. Ignition of the fuel, which is in the form of minute droplets, is effected by heat of compression of the charge of air. The combustion process does not depend therefore upon the formation of a homogeneous mixture of fuel and air: instead, the droplets of fuel become individually ignited in the presence of an excess of air and there is virtually no limit to the extent to which the ratio of fuel to air may be reduced. It is quite normal for a diesel engine to idle satisfactorily with a mixture strength corresponding to a fuel concentration no greater than 15 per cent of that needed to consume the whole of the oxygen present in the available air. On the other hand, the droplets of ignited fuel can only continue to burn if an adequate supply of air can be brought into contact with them in the very short time during which combustion can take place, and in practice, it is not possible for more than about 85 per cent of the available oxygen to be consumed and at the same time ensure complete combustion of the fuel. Thus, when idling or lightly loaded, a diesel operates on a very weak mixture—much weaker than any that can be achieved in a petrol engine—while the mixture required to produce the rated output corresponds roughly to the weakest mixture that can be employed in a petrol engine.

Providing therefore that a diesel engine is working within its rated capacity, an excess of oxygen is always present and no more than a trace of carbon monoxide can be detected in the exhaust emission even though there may be a slight haze of smoke. Only under conditions when the amount of fuel injected into one or more of the cylinders is such that there is an insufficient excess of air to effect complete combustion, will the exhaust emission contain both particles of free carbon and carbon monoxide gas. The amounts of these products of incomplete combustion will of course depend upon the degree to which fuel is in excess, but in the worst conditions copious black smoke will be emitted together with an appreciable amount of carbon monoxide, though less than would be found in the exhaust emission from a petrol engine when operating on a grossly over-rich mixture.

The Causes of Smoke

But if the combustion process in the diesel engine is such that there is no practical difficulty in ensuring that the fuel is completely burned, or virtually so—and it is a fact that the manufacturers' rated output can be readily obtained with an exhaust emission that is quite free from objection—why is it that the engine has been the subject of so much complaint? The answer is two-fold. Firstly, the fuel injection system demands skilled and regular, though not frequent, maintenance to ensure that the requisite volume of fuel is metered to the injectors and is sprayed into the cylinders in the correct pattern. The majority of operators, and in particular, those responsible for large fleets, look after this requirement and in addition maintain both the engine itself and its various accessories on a scheduled basis. The second part of the answer is concerned with the power output of the engine. Additional power, over and above the rated capacity, can be obtained by increasing the amount of fuel metered to the injectors, and in such circumstances a smoky exhaust emission is inevitably produced. Even so, there is a temptation, particularly in the case of heavy goods vehicles to adopt this course of action if a vehicle is under-powered in relation to the load it is desired to carry; the fact that fuel consumption will be disproportionately increased may not be regarded as a serious penalty. This practice is not followed by operators of public service vehicles, who are much more sensitive to public complaints, and are interested also in achieving maximum economy in fuel consumption, and in the majority of fleets, engines are de-rated by some 5 to 10 per cent, thus providing a margin against any variations in adjustment which may occur within scheduled maintenance periods.

Petrol Exhausts

Coming now to the petrol engine, it has already been mentioned that the rated power output can only be achieved by using an over-rich fuel-air mixture. Recently published data in respect of engines in use in the U.S.A. show that during idling and deceleration, the exhaust emission will contain an average of over 5 per cent of carbon monoxide. When cruising, the average decreases to 0·8 per cent, but during acceleration, over 4 per cent of carbon monoxide is present in the exhaust stream. For British cars, which are powered by smaller engines in relation to vehicle weight, the volumes of carbon monoxide emitted under these various conditions of running are somewhat higher.

The exhaust emission from both petrol and diesel engines does of course contain constituents other than nitrogen, carbon dioxide, carbon monoxide, water vapour, and at times, free carbon. Reference has already been made to oxides of nitrogen and sulphur, and to lead and phosphorus compounds (from petrol). Hydrogen, to the extent of 1 per cent or more, will be present, and in addition, hydrocarbons of various types and so far, over 200 individual compounds have been identified, though in total they comprise less than 0·2 per cent of the exhaust stream; some of them have been found to be carcinogenic when tested on experimental animals.

The figures quoted for carbon monoxide in the exhaust emission from petrol engines may seem large, while dark smoke emitted from diesel-engined vehicles, whether a danger to health or not, can at times lead to serious obscuration of the road ahead.

Certain other of the constituents of the exhaust emission from road vehicles may also be harmful if their concentration is above certain limits. But what really matters is not so much the amounts that are emitted from the exhaust tail pipe, but the amounts which are breathed. In this connection it must be remembered that the exhaust emission is rapidly diluted in contact with the air and at a yard from its outlet, the concentration of the emission is reduced one-hundred fold. With these facts in mind, the most recent investigations of the Medical Research Council's Air Pollution Research Unit, under Dr. P. J. Lawther, have been directed to the worst conditions likely to be encountered, i.e., those in road tunnels. In a report published in the British Journal of Industrial Medicine (Volume 18, page 250, 1961) it was stated that the concentrations of smoke and polycyclic hydrocarbons in the Blackwall and Rotherhithe tunnels were found to be much higher than the average volumes in Central London, but were of the same order of magnitude as those occurring during temperature inversions on winter evenings when smoke from coal fires accumulates at low level. It was further stated that the concentration of pollution in the tunnels did not appear to be high enough to create any special hazard for short term exposures. The atmosphere at peak periods became very dirty and unpleasant and the concentration of carbon monoxide was such as would be sufficient to produce some effect over a period of several hours' continuous exposure. It was added that "the total emission of pollution from road vehicles must still be small in comparison with that from coal fires, but the effect of traffic on the concentration of smoke, polycyclic hydrocarbons, carbon monoxide, and lead in the air of city streets deserves continued study".

Exhaust Filters

Some remarks should perhaps be made on the subject of exhaust filters, a matter which is receiving considerable attention in the U.S.A. primarily in connection with the Los Angeles smog. It should be emphasized that this phenomenon is fundamentally different from the temperature inversion fogs encountered from time to time in London and other industrial areas in Great Britain.

The purposes of the device being developed to meet the specification laid down by the State of California is to reduce the amounts of both carbon monoxide and hydrocarbons in the exhaust emission from petrol engines. Two distinct types are involved both depending upon the oxidation of the unburnt gases before emission from the exhaust tail pipe; their design and positioning are such that they can replace the exhaust silencer. One is a direct flame device. It consists of a combustion chamber to which a supply of air is provided either by a venturi arrangement or by means of an air pump; a spark-ignition source is also required. In order to maintain a combustible mixture under many conditions of engine operation, it is necessary to improve the combustibility by heat exchange, by addition of fuel, or a combination of the two. The devices operate at a temperature of 800-900°C. and it is obvious that the selection of a suitable metal for construction of the combustion chamber is not the least amongst the problems involved.

The other type of device makes use of a catalyst bed to promote oxidation of the gases. The catalyst may be of low temperature variety in which case the device will operate at temperatures between about 200-450°C. according to design. With a more temperature resistant catalyst, the operating temperature is about 600°C. With either a low- or high-temperature catalyst, provision must be made for a supply of air; it is also necessary to prevent over-heating, which would destroy the catalyst. A major problem in the design and development of these devices is to avoid reduction in the useful life of the catalyst by poisoning with lead compounds present in the exhaust gases.

Amongst the requirements detailed by the California Authority are that an after-burner, whether direct flame or catalyst type, shall be capable of purifying the exhaust emission so that carbon monoxide does not exceed 1·5 per cent, the limit for hydrocarbons being 275 parts per million; another is that the device shall remain effective over a period of 12,000 miles running. The first mentioned of these requirements is assessed by means of a special dynamometer test; the second is of course determined by service tests. Several devices, one being of British manufacture are at present undergoing tests in California, though to date none has yet received full approval. It is only when two makes have succeeded in passing all the required tests that the fitment of an exhaust purifying device will be made mandatory in the State.

The problem of providing a device suitable for diesel-engined vehicles appears to be an even more difficult one and little progress has been made so far either in the U.S.A. or in Europe. The purpose of such a device would presumably be to reduce or eliminate the emission of smoke. It is suggested that a more promising line of attack would be to make it mandatory for diesel engines to be operated within their rated capacity and to be subjected to skilled maintenance at the requisite intervals.

There has been considerably more success in the U.S.A. with the development of devices for dealing with crankcase emissions from petrol engines. As a result of action by the American Automobile Manufacturers Association, all 1961 and subsequent model vehicles offered for sale in California have been fitted with crankcase control equipment and such application has now become nationwide. The primary purpose of the systems, of which there are four main classes, is to reduce the emission of hydrocarbons, but it has now become appreciated that crankcase emission odour is in itself a nuisance to the driver and as a result, future approvals by the Californian Board will be limited to those systems which provide for the return of virtually all blow-by gases to the induction system. Such systems will more than comply with the requirement covering maximum permitted emission of hydrocarbons. To date 21 systems have been approved for fitment to new cars and 2 for used cars. The development of systems to meet the requirements of the Californian Board has not been without difficulty, due in part to the design of carburettors commonly used in American cars. It is the opinion that less trouble would be encountered with British cars and it is understood that one of the systems already approved has been produced by a British firm, doubtless with an eye to the export market. There does not so far appear to have been a demand for crankcase emission control devices in this country, but if the need should arise there is both our own and American experience to draw upon.

North Sea Search

The Gas Council will be associated with Pan American International Exploration (an operating subsidiary of the American International Oil Company) in carrying out a geophysical survey in the North Sea. The survey is planned for the coming summer months and is being made in order to assess the prospects of finding oil and natural gas. All the information resulting from the survey, which will cover approximately 20,000 square miles off the Yorkshire/Lincolnshire/Norfolk coast, will be made available to the Council.

Liquid Fuel Report

The report of the Combustion Engineering Association's Conference on "Getting the Best out of Liquid Fuel in Industry", held at Harrogate in November last, is now published. Copies may be obtained from the Association at 70 Jermyn Street, London, S.W.1, at 45s., or lower prices for quantities.

Plans for Scarborough

Conference and Exhibition Prospects

The arrangements for the Society's 30th annual conference and 6th clean air exhibition, at Scarborough, from October 8 to 11, are now almost complete. It is hoped that the conference will be opened, on the Tuesday morning, by the Joint Parliamentary Secretary to the Ministry of Housing and Local Government, the Rt. Hon. Lord Hastings, preceded by a civic welcome by the Mayor of Harrogate, and followed by the first Presidential Address from Dr. Albert Parker.

Smoke control areas and their problems will again have a full session, with discussion to be prefaced by papers to be given by Miss M. Lovell Burgess, Lectures Officer to the Gas Council, and Mr. Eric Bellingham. Mr. Bellingham has special qualifications, having been a Town Clerk and a Director of the Coal Utilization Council.

Dr. Mary Catterall, Research Officer on Respiratory Diseases at Leeds Infirmary, is to give a paper on the health aspects of air pollution, and it is expected that there will be a paper or report on road vehicle pollution. A further session will be on the experiences of a large industrial organization (I.C.I.), with a paper to be balanced by one on the experiences of the Technical Committee of the Warwickshire Clean Air Council.

There will be a series of papers on research and development in the field of clean air and fuel utilization, with contributions on behalf of the Gas Council, the Central Electricity Generating Board, the National Coal Board, the Electrical Research Association, and the Warren Spring Laboratory. A film session is being arranged which, in addition to films of special technical interest will, it is hoped, include one or two films from overseas.

Finally, on the Friday morning, there is to be a special Technical Session on the important subject of grit and dust emission control. There will be a paper on Methods and Equipment by Mr. L. Clegg, of N.I.F.E.S., and on the Administration of the Act by Mr. H. G. Sugden, C.P.H.I. for Middlesbrough.

The Exhibition

The Clean Air Exhibition, also to be held in the Spa in conjunction with the conference, promises to be the largest and most comprehensive yet staged by the Society. It will be open from Tuesday morning to noon on Friday.

This year, the Exhibition will occupy four halls in the Spa, each interconnected, and at the time of going to press, only one open site on the ground floor and three in the ballroom remain unsold. There are still a number of shell stands available, ranging in size from 10 ft. by 6 ft. to 12 ft. by 10 ft., but potential exhibitors who have not yet applied for space should do so without delay.

Among the many features at this year's exhibition is Electricity Avenue, devoted to all forms of electric space heating, a comprehensive display of solid smokeless fuels and appliances designed to burn them, a demonstration of the new N.C.B. "premium" smokeless fuel under fire, affectionately called "Bronowski's Bullets", displays of gas-coke and gas-fired central heating systems and gas room heaters and oil-fired boilers for the home.

Special emphasis is being given to the work of research and the Department of Scientific & Industrial Research and the British Coal Utilization Research Association are demonstrating progress in their respective fields.

Industrial Applications

As the special Conference Technical Session is being devoted to industrial dust and grit emission products, great interest will be aroused in the display of dust collectors and grit arresters being exhibited by a number of specialist firms in this field.

On the first day of the Exhibition, Tuesday, 8th, members of the trade throughout the North of England and the Midlands are being invited to attend, including appliance distributors and agents, fuel distributors, heating engineers, plumbers, architects, etc.

For further information concerning the Exhibition, a copy of the Prospectus and details concerning space still available, please apply to: Exhibition Organizer, National Society for Clean Air, Field House, Breams Buildings, London, E.C.4. (Telephone CHAncery 5038).

Gas Engineers' Centenary

We offer our cordial congratulations to the Institution of Gas Engineers on the celebration of their centenary, and the very successful holding of their 100th Annual General Meeting in London from May 14 to 17. This meeting is in fact a full-scale conference, with important addresses, technical papers, visits and social events. On the opening day there was a memorable Presidential Address by Dr. A. E. Haffner, Member of the Board and Chief Engineer, Southern Gas Board, in which he looked affectionately back to the past, and confidently forward to the future. The catholic outlook of the Institution was shown by special Centenary Addresses—one on "Good Engineering" by Sir Henry Jones, Chairman of the Gas Council; one on "Patterns of Growth—the Gas and Electricity Supply Industries", by Sir Christopher Hinton, Chairman of the Central Electricity Generating Board; by Sir Cyril Hinshelwood, Past-President of the Royal Society, and by Sir Harold Hartley. Among the many visits arranged was one—for which there was great demand—to the Esso Refinery at Fawley.

Special centenary exhibitions were staged at the Central Hall, where the meetings were held, at Watson House, the gas research centre, and at the Institution's offices in Grosvenor Crescent.

An important feature of the occasion was the publication of a history of the Institution, compiled and written by Dr. W. T. K. Braunholtz, who is well-known and esteemed as the Secretary of the Institution until his retirement a few years ago. The volume is a substantial one, and is a well-planned and informative account of the Institution—under several names—and is almost a history of the gas industry itself. The year-by-year accounts of the discussions and problems, the movements and developments, provide a fascinating picture of the evolution of a great industry.

A few years ago gas seemed to be on the point of becoming a declining industry, but the development of new methods of production and of use have decisively reversed the trend, and the confidence and optimism for the future that now pervades the industry was reflected in the centenary meeting and was especially crystallized in Dr. Haffner's address.

Of Cobwebs and Such Like Things

Dr. N. M. Potter, F.R.I.C., F.Inst.F.*

Everyone is familiar with the cobweb. My newspaper this morning (*Daily Telegraph*, March 14, 1963) quotes Lord Montgomery as having asked the House of Lords to "Sweep away the cobwebs from the Service Ministries". The paper commented—"Was Field Marshal Viscount Montgomery the spider, or was he Miss Muffett?" Clearly, there are two implications; cobwebs appear very quickly in rusticating offices and that the spider is responsible. The medieval word for cobweb was "coppeweb" the word "coppe" meaning spider; it is not surprising therefore that cobwebs are generally associated with spiders, yet the patternless webs which appear in the corners of empty rooms, or the tenuous threads which hang from the chandeliers, are rarely associated with living insects. Very few of the enthusiastic housewives who clear these away quickly with long-handled dusters or brushes pause to consider the miraculous birth of the cobweb from our smog laden air. Most of the domestic cobwebs are in fact formed from congealed threads of smoke precipitated invisibly from the atmosphere.

About this time, most housewives are pressing their husbands into washing paintwork or cleaning the dirt from wallpaper or near radiators. The spring-clean is on and there is a boom in decoration. All this winter dirt is generally thought to be a product of one's own system of heating. Yet pattern staining as it is termed, and cobwebs, both have their origin in the general pollution of the air—the universal pall which dissipates so slowly over the whole of these islands. Those of us who burn nothing but smokeless fuel still suffer from this evil and our problem will not be solved until the whole industrial and domestic activity in Britain is burning fuel without making smoke.

The thermal precipitator is a standard instrument for measuring pollution. It has long been known that there is a dust free zone near to a hot wire, and if the filament is surrounded by a cold surface any dust passing through the tube so formed will be thrown out on to the cold surface, and can be readily seen with a microscope. In this way, the total dust in a sample of air may be demonstrated and evaluated. The reason for this is not always fully understood. The molecules in any gas are in high speed motion. Their speed depends on the temperature; the so-called kinetic theory of gases. Obviously, in the vicinity of the hot wire the molecules of air are moving faster than those near the cold surface. A particle of dust moving parallel with the wire, but without any vibratory motion comparable with the gas molecule, receives a heavy bombardment from the hot side by comparison with the cold. In spite of the relatively enormous weight of the smoke particle it gradually moves across and comes to rest on the cold surface. This is called Brownian movement and may be observed experimentally with the aid of a microscope. Why should it come so firmly to rest on a vertical surface?

This involves another concept of physics which can be explained in simple terms. There is a general flow pattern of air in the hypothetical tube in addition to the rapid motion of the molecules which are colliding with each other perpetually like high speed billiard balls. Imagine a loose crowd moving down a street and each person jostling his neighbour as he moves along. Near the wall the flow will be slower. The wall exerts a drag. In fact, a perfectly smooth surface has a thin layer of stagnant gas attached and motionless. The faster the general body of movement the thinner the stagnant layer. If there is a roughness at any point violent disturbances, called vortices, are thrown off in the same way that a pillar box by the wall would upset the teaming throng in the narrow street. So it is that the dust particle is eventually "kicked out of play" like a football, and the skin of still air attached to the wall immediately covers it again so that the particle is no longer subject to moving forces. It is still difficult to understand why it is held so firmly by the wall. There must be some attraction; and indeed there is. A crystal is held together by the forces between dissimilar atoms like an orderly pack of magnets. Break the crystal and some loose magnetic forces are exposed. A particle of dust contains many types of irregular bondings, and so has the wall surface, so there are residual forces always present which hold the dust particle quite firmly once contact is established. If it is a relatively large particle, two things may happen. Should the velocity of the air suddenly increase, the stagnant layer gets thinner and the particle may project through into the air stream where it could be dislodged by the wind pressure just as a particle of sand is blown across the sea shore. On the other hand, if the force is not strong enough to dislodge it, the particle throws off small eddy currents or vortices which flow away from the particle like the eddy currents from a boulder in a stream.

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* The Author is a member of the Society and is Assistant to Managing Director, Coal Products Division, National Coal Board.

Pattern Staining

All this seems very remote from the cobweb and pattern staining, yet in fact it is the very essence. First of all, look carefully at the pattern stains. These occur on the cold walls over hot pipes and radiators. Thermal precipitation encouraged by the vortices produced by the hot rising air currents are the main causes of deposition. Put a cover over the radiator and the problem is lessened. The hot currents near to the radiator are taken further away from the wall and mix with the cooler air remote from the cold surface. Radiators are normally put under windows which are washed regularly in any case. Examine the walls of the room which face the outside. These are by far the dirtiest; simply because they are colder. The lounge of a centrally heated house in which I once lived had three external walls. During one cold winter spell the walls became so black that redecoration was essential. The hairline cracks in the plaster stood out like crazy paving. The remedy is simple; plaster or hardboard the wall surfaces in order to stop the cold coming through the bricks, or better still convert to ducted warm air heating which avoids the large temperature differential associated with hot metal surfaces. The ceiling of a centrally heated bedroom often presents a peculiar effect, especially if additional insulation has been omitted. The rafters show up as white strips because the wood is a poor conductor of heat. If the ceiling is plasterboard and nailed to the rafters then a most odd effect may be observed. Each nail head appears black because the metal conducts the heat away and hence causes a local spot of thermal precipitation. Dark spots on the ceiling may be observed above naked lamp bulbs. The electric light does not produce dust but the heat from the bulb causes thermal precipitation.

In the winter therefore when our atmosphere is laden with invisible dirt and the difference between the outside and inside temperature is at a maximum, all the "fresh air" coming into the house is seeking to drop its load, and imperceptible layers of soot are built up on our walls and ceilings. Cobwebs are a particular form of precipitation. A common location is a chandelier hanging over a stairwell. A current of air rises upwards past the light fittings. Particles of dust tend to build up on any solid projection—it may be a piece of fabric or an irregularity of the surface. That projection, and the disturbance it produces in the ascending air, is a preferential point for further settlement so a thread builds up, one particle on top of another. Imagine a flotilla of small boats, each of which has a magnet at the front and rear. If one of the boats is suddenly held against the side then it will attract the other magnets, one by one, until there is a line of boats joined to the wall. This is how the floating filaments of dust are built up in the vicinity of rising currents. When examined under the microscope the filaments are seen to be made up like a string of irregular "sausages", each "sausage" being a variety of smoke particles.

Trapeze Growth

The waving filament acts as a collector and picks more and more particles up from the currents of air. As the thread of smoke particles moves about in the adventitious air currents the loose end may touch a solid object and become fastened. In this way a permanent trapeze is formed as the first leg of a massive cobweb system. The most amazing feature is the speed of growth. In a heavily polluted area I have observed threads two feet long linking apparatus on the bench appear overnight.

Obviously any thread projecting into the air will pick up smoke particles the end making the starting point of the smoke chain. This is why window curtains pick up so much dirt in the winter. The particles are moved towards the cold window and are then picked up. But why do the curtains rot? Surely innocuous carbonaceous particles cannot destroy fabric. Smoke particles—some are liquid and some solid—have the remarkable property of absorbing sulphur oxide gases from the other flue gases. Soot is extremely acidic and good gardeners always leave it out to weather before use. This leaches out the free sulphur acids. The smoke particles which escape into the atmosphere are also acidic and once out into the atmosphere they mix with the wind and disappear from view. But they are acidic nevertheless and hence the effect on the fabric. It may be a long time before particles come to rest on a surface or coalesce by meeting other particles. Indeed the half life period of an escaped smoke particle may be as long as six days—long enough for pollution to spread the length and breadth of these islands. Obviously, a genuine spider's web acts as an inefficient filter and will accumulate smoke and dust until the original shape is lost—but how often do spiders weave their webs in disused rooms? Indeed, most atmospheric filters depend on fine fibres for collecting smoke and dust. The particles are not caught in the same way as a fish is trapped by a net. The holes in most filters are in fact many times, sometimes thousands of times, larger than the particles filtered. If the bed is thick enough the chance of a particle passing through can be made very remote even though the spacing is so large. It is possible, therefore, to make filters which are effective, have a low resistance to gas flow, and collect relatively large weights of air pollution.

The well-known labyrinth filter operates differently. In this type the gas is made to change its direction by a series of baffles. But the solid particles have an additional momentum which can take them through the stationary gas layer, to the sides and base of the labyrinth and once settled out they are not easily disturbed again.

You may have observed that cobwebs often appear in the corners of rooms. These are places where the movement of air is at a minimum. Air currents eddy towards the recesses of a room and gradually there is a build-up of filaments across the short distances between the adjoining surfaces and these filaments gradually fill themselves up to form a continuous but irregular lace pattern. Similarly, leaves and waste paper come to rest in the corners of gardens.

The invisible pollution therefore makes itself visible in two familiar effects; the steady discolouration of all cool surfaces and the formation of cobwebs.

The smut is another familiar object in our daily lives. Some years ago I lived in the suburbs of Sheffield. This was before the Clean Air Act and the excellent lead set by the City Council in the establishment of Smoke Control Areas. The general fuel used was very smoky coal and, on the few days that one sat outside in the year, an enormous flake of soot was liable to come to rest on your newspaper or shirt. The coalescence of particles is one of the main means of removing dust from the atmosphere. Chimney soot is smoke which has coalesced and precipitated because of the excess eddy currents produced in the hot chimney and the rough surfaces. The odd flake of soot may be formed near the top of the chimney and escape into the atmosphere. It soon falls to the ground and may be a considerable nuisance. Many of you may have noticed occasionally a smut form from tobacco smoke, so rapidly does coalescence take place when particles are in close proximity. I have mentioned the residual forces on the surface of particles which hold them firmly together once they meet. But it is also possible for particles, especially large ones, to receive a static electric charge simply by virtue of their movement through the air. If dust is blown suddenly from a metal nozzle by dry compressed air it is possible to obtain an electric discharge from the nozzle and even to produce a coronary discharge. Dust particles, particularly those formed artificially, usually carry static electric charges. If particles carry similar charges, obviously there is mutual repulsion but if charged oppositely then coagulation can occur.

Smoke has presented the scientists with many interesting phenomena, many problems, and an enormous field for study and observation. Some is of fundamental importance and has a bearing in many industrial processes. But for the citizen there are no compensating factors. The sooner we have finished with it the better. As Don Quixote says in the novel by Cervantes, "I can look sharp as well as another, and let me alone to keep the cobwebs out of my eyes".

The Cost of Corrosion

In a lecture at Belfast to the Northern Ireland Branch of the Institution of Structural Engineers, on "Corrosion and the Structural Engineer", Mr. Morris T. Shaw, Chief Civil and Structural Engineer, the War Office, said that air pollution was one of the greatest causes of severe corrosion as well as being harmful to health. On the annual cost of corrosion in the U.K. Mr. Shaw gave the following estimates:

> Preservation of structures and plant by painting, galvanizing and other processes, £200 millions.
>
> Capital expenditure on new plant due to wastage, major repairs, "outage" time or loss of production whilst plants and structures were out of operation, £400 millions.
>
> Total annual cost: £600 millions.

The Housewarming Centre at 126 Station Road, Edgware, which Lord Robens formally opened on May 14, is the largest of such centres set up by the National Coal Board in several parts of the country in the last few years.

Three thousand square feet of showroom, on two floors of a modern block right in the heart of the shopping centre of this thriving north-west London suburb and within 150 yards of the Edgware Underground station, offers the space to display at any one time, 70 or so of the modern domestic solid fuel appliances and associated systems and gives the prospective buyer the convenience and advantage of seeing many of the installations under fire.

Reviews

The Assault on our Environment

Our Synthetic Environment. By Lewis Herber. Jonathan Cape, London. pp. 285 + xx. 25s. net.

Silent Spring. By Rachel Carson. Hamish Hamilton, London, pp. 304. 25s. net.

IT is not easy to review either of these books in a journal that is concerned only with air pollution. The temptation is great to discuss the very much wider field they cover. Mr. Herber deals with air pollution as one of the many environmental hazards that modern man has made for himself and for much other life on this planet, largely through ignorance and heedlessness. One of his chapters overlaps with Miss Carson, whose book is primarily concerned with the dangers arising from purposeful activities—the use of pesticides. If the emissions from an industrial plant injure crops it is a clear case of harmful air pollution. If the crop is sprayed to protect it from pests, with the result that birds and animals are also killed or harmed, it is not air pollution in the usual sense, and it calls for controls of quite a different character.

Both books are clearly and forcefully written, and the authors, both American, rely on numerous quotations, reports and statistics, all of which are fully referenced. Miss Carson's is the more "popular" book and might have been more telling if it had been written in a somewhat lower emotional key. With a wealth of facts and figures on the feckless use of the new and potent chemicals, it has been criticized for presenting only the case for the prosecution. But this seems to be beside the point—we all know that these chemicals do some immediate good, for the specific purpose for which they are used, or they would soon cease to be used. What was necessary, and what the author does in a way that is literally frightening, is to show how extensive and serious the side-effects can be if they are used without stringent precautions and a full understanding of the possible consequences. The problem has a close analogy to that of new drugs for human use. She is not against the control of insects and other pests, which beyond all argument are a major menance to the production of food for the world's ever-growing population, and possible methods of control other than by chemical spraying are described in the final chapter.

The book has an excellent introduction by Lord Shackleton and a short but thoughtful preface by Sir Julian Huxley. From the latter the following may be quoted, as it crystallizes the basic problem:

> "Pest control is of course necessary and desirable, but it is an ecological matter and cannot be handed over entirely to the chemists. The present campaign for mass chemical control, besides being fostered by the profit motive, is another symptom of our exaggeratedly technological and quantitative approach. The ecological approach, on the other hand, involves aiming at a dynamic balance, an integrated pattern of adjustment between a number of competing factors or even apparently conflicting interests . . . though chemical control can be very useful, it too needs to be controlled, and should only be permitted when other methods are not available, and then under strict regulation and in relation to overall ecological planning".

Air pollution, in our usual meaning of the phrase, is also an ecological problem, and Mr. Herber's study of the way mankind is altering his environment—mostly without understanding or moral purpose—includes air pollution as one of the major factors involved. Air pollution takes up, in fact, the greater part of his chapter on "The problem of Over-Urbanization" in a section on "Urban Life and Health". The other main sections of this well-arranged book are on the problem itself, agriculture and health (dealing not only with pest control methods but soil erosion and fertilization), the problems of chemicals in food, environment and cancer, radiation and health, and human ecology. There is a concluding section on the industrial and social aspects of health, remedial legislation, and an intriguing and thoughtful discussion on the possibilities and value of decentralization—back to the land, or at least to the simpler, more wholesome and satisfying kind of life associated with the land, the kind of life so distorted by modern urban and suburban modes of living.

One health factor, frequently ignored, that is stressed by Herber is that of the subclinical disorders which may persist without ever assuming an overt form. He quotes Robert A. Kehoe of the University of Cincinnati, who has asked, after a review of the toxicants, physical hazards, radioactive pollutants, and "welter of activities" created by our synthetic environment:

"But what are the consequences, through the working lifetime, of the frequent, almost daily, impacts of individual and collective insults of minor or subclinical severity?"

Is not air pollution, as we experience it daily, a form of continuous insult to the body of precisely this kind? And is it not likely that there are sub-clinical effects of air pollution which are, to the community, the most serious consequence of the problem, even though they may only become apparent when other stresses are experienced? A study of this thoughtful book, with its examination of the other harmful stresses we create through our synthetic environment, is recommended.

Electrostatic Precipitation

Industrial Electrostatic Precipitation. By Harry C. White. Addison-Wesley Publishing Co., Inc., Portland U.S.A., and Pergamon Press, Oxford, England. pp. 376. 94s. net.

This is a complete and coherent text book on the theory and practice of electrostatic precipitation, a subject which, as the author says, has its literature widely scattered through many domestic and foreign technical and scientific journals. It is intended on the one hand for the use of engineers and scientists concerned with the technology of gas cleaning, air pollution control, and recovery of valuable particulate matter from gases; and on the other for research workers in electrostatic processes, gaseous electronics, and particle physics.

The first three chapters provide a basic introduction to the elements of the process, together with a fundamental treatment of the relevant characteristics of aerosols. Further chapters deal with the fundamental processes and physical theory, and others with the major technical questions of gas flow, particle restivity, and particle re-entrainment. The final chapter links the fundamentals with the practical design of precipitators. There is also a comprehensive bibliography of several hundred references to the scientific and technical literature.

The Identification of Atmospheric Dust by Use of the Microscope. By E. M. Hamilton and W. D. Jarvis. Central Electricity Generating Board Research & Development Department.

The use of the microscope as a means of identifying the type and character of material deposited on the heating surfaces of coal-fired boilers was first developed by Dr. H. E. Crossley in 1944 at the Fuel Research Station of D.S.I.R. in 1944. This technique of examination was subsequently applied to gritty matter collected in the hoppers serving mechanical dust arresters and electrostatic precipitators and also to the dust entrained in the flue gases entering the chimney. This information has served as a basis on which to compare the appearance of samples of dust collected in the vicinity of power stations or other industrial plants in order to trace their source.

In this 32-page monograph, the authors have set out to show by means of colour photomicrographs the characteristic appearance of the various types of particulate matter derived from boiler plant and other sources. It will be of considerable value to those who are concerned with the identification of solid particulate matter falling out of the atmosphere.

Smoke Inspector's Handbook Two. By Arthur Coe and Ian M. Coe. pp. 258. College of Fuel Technology, London. 42s. post-free from the publishers.

This second part of the handbook is up to the excellent standard of its companion volume. Its contents would be of value to students of fuel technology and combustion engineering as well as to smoke inspectors, for it deals fully with all the principal industrial combustion requirements and methods: the different types of stokers and boilers, instrumentation, automatic control, etc. Dust and grit arrestment and flue gas washing are described and there are separate chapters on oil firing. Types of problem that do cause remedial difficulties—wood burning and incineration—are considered, as are railway engines and cupolas. There is also a chapter entitled "Smoke Control Areas", which is largely a technical review of domestic solid fuel appliances, principles of design and installation, chimneys and thermal insulation.

A concluding chapter on the dispersal of pollutants from chimneys is a useful review of this subject, and, like all the handbook, is written clearly and concisely. The two handbooks pack a remarkable amount of information into relatively small compass, and the smoke inspector who knows his way about the two volumes will be well equipped to deal with most of the problems he is likely to come up against, as well perhaps as some he is not.

Methods for the Measurement of Air Pollution: Part 3. Determination of Sulphur Dioxide. British Standard 1747: Part 3: 1963. pp. 12. British Standards Institution, London. 4s. net.

This new BS relates to the measurement of sulphur dioxide in the atmosphere by the method of drawing a measured quantity of air, after filtration to remove suspended matter, through a solution of hydrogen peroxide, and then determining the net acidity of the solution. The apparatus, reagents, procedure and calculations are described.

Symposium: Air Over Cities. Report of a conference sponsored by the Division of Air Pollution, U.S. Department of Health Education and Welfare, November, 1961.

This 290 page report contains the 20 papers read and discussed at this symposium. The papers in the first section are mainly general surveys of pollution in various cities. The second section groups papers under the heading of "The Dispersion and Deposition of Air Pollutants over Cities", and in the third section there are papers on "Present and Future Needs for Meteorological and Air Quality Observations."

Warren Spring Laboratory: Report for 1962. Department of Scientific and Industrial Research. pp. 28. H.M.S.O. 4s. net. U.S.A. 80 cents.

For those concerned with air pollution the report is perhaps of particular interest for the information it gives about the considerable amount of work other than that on air pollution with which the Laboratory is concerned. The air pollution section takes up in fact only three pages of the report. Much of this is described in the contribution from the Laboratory in the *Clean Air Year Book* and need not be summarized here. But of particular interest is the account of the smoke test that is used in Belgium for measuring the smoke from diesel vehicles. This test can be applied only to a stationary vehicle. In order to relate the results from this stationary test to the results that would be obtained if the same vehicle could be tested while moving along a road, a commercial vehicle was placed on rollers at the Motor Industry Research Association Laboratory, at Nuneaton. It was found that a test on a stationary vehicle tends to underestimate the amount of smoke than would be emitted when, say, a heavy goods vehicle is climbing a steep hill. The results of the tests have been passed to the Ministry of Transport.

Annals of Occupational Hygiene. Vol. 5, Oct-Dec. 1962. Report of Conference on Carbon Monoxide. Pergamon Press, Oxford.

This issue of this journal consists entirely of the papers and discussions of the 13th conference of the British Occupational Hygiene Society, held in London in April, 1962, on the subject of carbon monoxide. There are eight papers, with an introduction by I. G. Norman and a summary by P. C. G. Isaac. All the papers are of interest to the student of air pollution, and of particular interest is that by P. J. Lawther, B. T. Commins and M. Henderson on "Carbon Monoxide in Town Air: an Interim Report".

A Report on Vehicle Exhausts

The Final Report of the Vehicle Exhaust Study Group of the Institute of Road Transport Engineers was published in March. Apart from introductory and acknowledgement paragraphs it is reproduced in full below. The report is being noted by the Society's Technical Committee in the course of its own examination of the problem.

The Group held fifteen meetings and issued interim reports in March 1962 and September 1962. All types of fume emission were originally considered. However, attention quickly focussed upon the salient problem of diesel engine exhaust smoke and this has comprised the heart of the entire investigation. Opinions and data have been obtained from authoritative sources both in Great Britain and overseas. Correspondence from I.R.T.E. members and others throughout the world has been received, much of it containing information based on fleet operating experience. The use of smokemeters has been studied.

The complexity of the problem of exhaust fume emission in a densely populated, industrial nation overshadows every attempt to find a solution. Nevertheless, this Study Group is convinced that if the problem is considered rationally, certain definite measures can be taken and some of these have been listed in the first and second interim reports.

This Final Report will summarise the work and findings already covered by the two interim reports. Furthermore, it will offer some thoughts on vehicle maintenance pertaining to the problems of smoke emission.

Medical Evidence

In its first interim report, the Group stated that it had failed to find any medical evidence to show that diesel exhaust smoke is a hazard to good health. There is, however, no denying that diesel exhaust fumes are unpleasant and a public nuisance.

Smokemeters

In its first interim report, the Group observed that the measurement of exhaust smoke density is fraught with difficulty. Tests carried out by members of the Group revealed that smokemeter results are influenced by too many variable factors to make them suitable for testing all diesel engined vehicles to a standard density limit. Nevertheless, there is much tendentious argument in Parliamentary and press circles seeking to justify the early introduction of smokemeters for determining a legal limit for smoke density.

If more stringent legislation is to be introduced at a fairly early date, the Group adheres to its conclusion that some form of stipulated power/weight ratio should provide its basis. This would be a practical measure which would tend to postpone the onset of visible exhaust smoke due to rapid deterioration of generally overworked engines. This provision would also relieve the problem of the slow moving and smoking vehicle, resulting from its being underpowered or having mismatched engine/transmission characteristics.

On the other hand, legislation which envisages the use of smokemeters presupposes the existence of dark smoke in the first instance and can therefore only operate in a punitive sense after the nuisance has occurred. It should not be supposed that this Group condemns the use of smokemeters as such. On the contrary, it would welcome their use as a deterrent, provided that the limit set is based on an absolute value to which all smokemeter readings can be related. This limit should take engine size (*i.e.* volume of exhaust emission) into consideration.

Fuels and Additives

While the Group feels that fuel characteristics do not vary with such significance as to be a critical factor in the exhaust smoke problem, it reiterates the hope that the subject of a specific gravity clause will receive attention.

It is acknowledged that some fuel additives can be effective in alleviating smoke emission in certain, given circumstances. Beyond this, however, it is thought that a solution to the exhaust smoke problem as a whole is unlikely to emanate from their use.

Vehicle Maintenance

To repudiate the popular and facile practice of attributing the emission of smoke to bad maintenance *alone*, this Study Group has gone to some pains in its two interim reports to indicate that, in its view, the factors which give rise to the emission of an unacceptable density of exhaust smoke are many and varied. Two factors which have been discussed in some detail are (*a*) fuel injection equipment, with special reference to service replacement units, and (*b*) the economic pressures which create a narrow margin between a satisfactory engine performance on the one hand, and the onset of visible exhaust smoke on the other.

Lack of maintenance and regular attention are major contributory factors in the emission of dark smoke from diesel engined vehicles. The large fleets of commercial and public service vehicles are usually operated under responsible management with a view to obtaining the highest efficiency. This, in turn, entails regular inspection and scheduled maintenance under the control of a road transport engineer and while the object is undeniably to maintain the vehicles at peak efficiency on economic grounds, its effect will be successfully to combat the adverse mechanical conditions that give rise to dark smoke emission.

In all too many of the smaller fleets, such attention is often lacking. In firms that do not enjoy the supervision of a transport engineer, vehicle maintenance may be virtually non-existent. This Group believes that vehicles are often driven "into the ground", with little or no thought for their roadworthiness, much less their proneness to emit dark smoke. Against such cases as these, legislation might well be the only solution, for it would appear that these offenders are beyond ordinary persuasion.

Yet there is much that even the one-man operator can do for himself. If he were to do no more than adhere to the vehicle manufacturer's normal maintenance schedule, this would look after the whole vehicle and a great deal of the problem of dark smoke emission would be overcome.

Fuel injection equipment is often mistakenly blamed for the incidence of dark smoke, whereas, in fact, there can be many other contributory causes. These can range from the simple case of a choked air filter to the more extreme case of an engine neglected to the point at which a complete overhaul is the only remedy. Between these two extremes there are innumerable contributory factors such as incorrectly adjusted tappets, burnt or worn valves or seats leading to loss of compression, and worn timing gears or pump couplings, resulting in incorrect injection or valve timing. In the case of pneumatically governed engines, attention must be paid to the venturi butterfly adjustment, the atmospheric breather and the condition of the diaphragm.

This Group does not overlook the fact that tampering with the maximum fuel stop or the excess fuel device may lead to excessive emission of exhaust smoke even from the best maintained vehicle. The fleet engineer is to a large extent dependent upon the driver for a reliable report of the condition of the vehicle's exhaust whilst on the road.

National Panel

In its first interim report, the Group recommended the setting up of a national panel representing all organisations interested in overcoming the problem of exhaust fume emission in Great Britain. In the Group's second interim report, it was recommended that such a panel or association might, *inter alia*, consider the establishment and enforcement of standard specifications for testing reconditioned fuel injection equipment, coupled with standards of workmanship and a code of practice applicable to fuel injection repairers.

The Group finds it almost incredible that no trade association exists in Great Britain, comparable to the Association of Diesel Specialists in the United States of America. The nature and scope of that organization is to relate, in common interests and purposes, those fuel injection specialists who are engaged in the precision overhaul and sale of fuel injection and allied equipment. Its primary objective is to promote and encourage the highest standards of ethics and workmanship among its members for the improvement of the diesel industry and the protection of its customers.

On the basis of this Study Group's investigations during the past two and a half years, it appears that the establishment of a British association with a similar, primary objective is much needed and is long overdue.

The Group acknowledges and commends the action taken by the British Standards Institution in setting up a Committee to prepare a Standard for the testing of automotive diesel engines. Even if the Standard includes clauses for limiting the exhaust smoke emission from new engines, the problem of subsequent excessive emissions from vehicles in use will not be covered within its framework. Nevertheless, it will be laying a sound foundation for further action by other appropriate bodies such as the national panel or association that this Study Group proposes.

British Pollution on U.S. Television

On the afternoon of February 19, the Society's office bore a marked resemblance to a film studio, the presence of Director, Cameraman, Sound Engineer and the inevitable continuity girl all combined to encourage the illusion.

The occasion was the filming of an introduction by Sir Hugh Beaver to a television feature being produced for the American Broadcasting Company of New York. A few days beforehand the producer of the feature had flown in from New York and within hours of landing had visited the Society and requested practical assistance with commentary writing and sequence planning and, more important, introductions to leading figures concerned with atmospheric pollution in this country.

In the course of the next three weeks the Society was able to provide various services to ensure the success of the film and, in addition to Sir Hugh Beaver, Dr. P. J. Lawther, Mr. G. B. Courtier, Commander J. R. E. Langworthy, Dr. J. H. Briscoe-Smith and Dr. S. R. Craxford were interviewed. Sequences were shot at Chiswick London Transport Garage, Battersea Power Station and County Hall and Warren Spring and co-operation willingly given by Shell-Mex, the Gas Council, the Central Electricity Generating Board and the American Embassy.

The film was broadcast from New York on April 30, under the title "Smog: the Silent Killer". A 16 mm. sound print of the film is promised to the Society and this will be shown to all those who co-operated in its production.

Correspondence

SULPHUR

The Editor, Smokeless Air,

Sir: Your article on "The Removal of Sulphur Pollution" invites comment.

Under 1, use of sulphur-free fuels you say that paraffin and kerosene could make a much bigger contribution than at present; yet on page 210 you quote Mr. Cornfield's parliamentary answer to Mr. Fitch's question, pointing out that four-fifths of the fuel oil is of high viscosity.

2. Much of the inorganic sulphur in coal can be removed by washing or cleaning; for "much" read "in certain cases about 20 per cent".

3. For removal of sulphur oxides from flue gases you rightly condemn wet washing (stopping the process at Battersea would reduce the pollution of the Thames at a cost of no detectable increase of SO_2 in the air we breathe in London), but say that dry processes are more hopeful, although only suitable for large installations. Anyone who has made simple calculations of the sheer magnitude and cost for a large installation would not share your hope.

4. As for dispersal of hot gases through high chimneys you say the average chimney is not likely to penetrate a smog inversion layer; true enough, because the "average" is so very small, but plumes from even moderate-sized chimneys can do this, for example that of the sugar refinery at Plaistow.

5. Your argument for higher efficiency and less fuel for the same job is unassailable, and your last point, that what matters is the sulphur in the air we breathe, is the crux of the matter.

Taking this last point, together with the first and second, it is helpful to look at the whole picture. Crude oil is imported into this country with just about the same sulphur content as our coal; both vary, but it is fair to take an average. In preparing coal for combustion there is no redistribution of the sulphur content; cleaned coal commonly has a sulphur content per lb. higher than, and per Btu. about the same as, uncleaned, and (again per Btu.) coke and smokeless fuels are similar. In refining oil, nearly all the sulphur goes into the heavy fractions. What little remains in the lightest fractions is taken out, but this is a negligible proportion of the total. Now if one person chooses to burn a gallon of light sulphur-free fuel oil, some other people will have to burn 4 gallons of heavier grade, some of it with more than 3 per cent sulphur in it. The stuff can't be stored or poured away, it must be burnt, and the oil companies must be expected to adjust their price structure so that it is. The overall emission of sulphur to the atmosphere is not altered.

But, as you say, it is not the overall emission but the ground level concentration that concerns us. Burning low sulphur fuel in small plants with low chimneys and the high sulphur fuels in large plants with tall chimneys is the right policy. With oil this is almost automatic. But there is room for some manoeuvre with coal too, because coals do differ. It would seem to be shortsighted on the part of the public to press for the selection of low-sulphur coals for a power station, for instance, for this can only result in the coals of higher sulphur content going to plants whose flue gases come down to where we can breathe them.

Yours, etc.,

F. F. Ross, M.Inst.F.

Reigate

The Editor,
Smokeless Air

Sir,—The several references to sulphur in the Spring number of the Journal, and again at the most interesting meeting in London on April 17, prompt me to offer a few comments on these related subjects. Even among our own members there is a quite understandable lack of appreciation of what one may perhaps term "trade terminology", and a quite simple error in this respect may tend to give rise to quite false impressions among the general public.

At the April meeting all the terms used in the above title were employed in close juxtaposition, scattered among references to petrol and diesel "fumes", and the sulphur content of coal, coke, etc. At the risk of attempting to comment on an equally wide variety of subjects myself, could I be allowed a few simple observations which may provide some tips to fellow members who are continually cornered, not to say upbraided, by the ill-informed.

1. *Sulphur Content*. Since all our fuels in the U.K. come from many sources, and sulphur percentages vary over a considerable range even in coal or petroleum found in geographically adjacent areas, it is not possible to quote a precise figure for either solid fuels or for petroleum. Nevertheless it is not unfair to make an approximation if it is realized that it is a general average, and that in a particular circumstance the figure may therefore not be exact.

The petroleum fuels, such as motor gasoline (petrol), kerosene, ("paraffin oil") and diesel fuel, are, however, manufactured to a fairly consistent sulphur figure. In the U.K., at present, the approximate average sulphur contents are as follows:.

	% by weight
Motor spirit	0·04
Kerosene for flueless heaters	0·04
Domestic central heating fuel:	
kerosene type	0·1
gas oil type	0·8
Automotive diesel fuel ("derv")	0·3
Industrial fuel oil: light	2·6
medium	3·3
heavy	3·6
Household coal supplies	1·6

When considering these figures in relation to the production of gaseous sulphur products liable to be discharged into the atmosphere, it must also be realized that, on a purely calorific basis, the heat content of the petroleum fuels is of the order of 1·6 (or more) times that of the solid fuels. Thus, for the production of a given amount of heat, the consumption of oil is less than two-thirds of the consumption of coal or coke.

Consequently, oil fuel produces only two-thirds of the sulphurous combustion products as a solid fuel of the same basic sulphur content. This fact is, of course, well known, but, equally, it is so often overlooked that it is as well to remind ourselves of it from time to time.

If, of course, distillate fuels are used—such as those quoted under (*b*) and (*c*) above, the discharge of sulphur gases may well be reduced by 90 per cent or more, dependent upon the actual circumstances.

2. "*Petrol*" *v.* "*Diesel*". Even after over 30 years of the so-called "diesel" road vehicle, there still seems to be confusion over nomenclature. While we all heartily endorse all that has been said about the disgusting habit of driving maladjusted compression-ignition engined vehicles so that they emit dense clouds of dirty, wasteful exhaust smoke, I must protest at the implication in some quarters that they also emit "petrol fumes". Moreover, diesel fumes, while they can be very unpleasant, are less dangerous than petrol engine exhausts in that they contain less carbon monoxide gas.

3. *Los Angeles Smog*. References were again made at our meeting to the Los Angeles problems, and, certainly, I agree with those who "do not want London to become another Los Angeles". But Los Angeles is by way of being a unique case. There is not the same price inducement in L.A. to make them as enthusiastic for the diesel vehicle as we are in the U.K.; on the contrary, so I understand, the concentration of petrol engined vehicles is about the highest in the world. Add to this the coastal conditions which are highly conducive to the formation of fogs, plus a geographical contour which prevents them drifting away inland—and thus the smog comes . . . and stays. As we were told two years ago when Mr. P. J. Harrop presented to us a paper on Motor Vehicle Pollution in the U.S.A., conditions here are in no way comparable.

Yours faithfully,
C. W. G. MARTIN.

Esher

N.I.F.E.S. Refresher Course

The annual refresher course for works and plant engineers organized by the National Industrial Fuel Efficiency Service will be held at the Prestatyn Holiday Camp from Monday, June 10 to Saturday, June 15. The subject of the course will be "Modern Boiler Plant for Steam Raising and Space Heating", and an inaugural address will be given by Lord Robens. Information from the Secretary of the Course, N.I.F.E.S., Baltic House, Mountstuart Square, Cardiff.

INTERNATIONAL SECTION

The Netherlands

BILL TO SET UP AIR POLLUTION COUNCIL

from

Professor J. W. Tesch

IT is only recently that air pollution in this country was considered as an important problem of environmental hygiene and consequently of health. The geographical conditions are such that heavy smogs as occurred in cities in England and, in other forms in other countries, probably have not occurred so far in this country.

In view of the rapidly increasing population density, concentration in towns and industrial areas and the industrialization as such, not forgetting the increasing traffic, it is satisfying to witness an increasing interest for the problems of the cleanliness of the atmosphere. In the beginning of last year, as part of the general health inspection under the Ministry of Social Affairs and Public Health, a section for environmental hygiene was set up. The responsibility for this section of public health has been recognized by the Bill which was submitted to the Lower House. It was introduced by the Ministry of Social Affairs and Public Health who remarked that the atmospheric pollution in several parts of the country is a problem of great concern, although serious consequences for the health of the people have not (yet) been proved. It is felt that influence on the health as has been established in England may occur here on a smaller scale.

Attention is also asked for the influence on mental health; it seems wise to consider the human being as a psycho-somatic unit. The adaptability to the fluctuating levels of pollution may be great, but nevertheless there is a growing feeling of commonsense that this adaptability may be overstressed.

Besides public health there are of course other aspects. There is clear proof of economic damage, for instance in horticulture ("bulbs"), agriculture and cattle-breeding.

In the bill which is introduced in the Lower House of the States-General it is proposed to establish a council where besides health experts all branches of human activities are represented.

It was encouraging that this council will be preceded by a committee which has the same composition as the proposed council and that this committee will work under the auspices of the Ministry of Public Health. This means that the Government considered air pollution in the first place as part of the Government's responsibility concerning health.

It is known that interest in these problems resulted in research activities in which are co-operating state and local institutions and the organization for Health Research T.N.O. It is envisaged that the committee and eventually the council will consider the need for stimulating the regional committees with advisory qualifications and also that in technical education at all levels, the teaching of problems of environmental hygiene will be included.

It is also to be hoped that the discussion in the committee will promote the recognition of the importance of clean air as part of the physical planning. It seems necessary that the possibility of a frame-law covering the whole field of air pollution will be seriously discussed.

Australia

AIR POLLUTION BY METALLURGICAL INDUSTRIES

This is the title of a report issued by the Division of Occupational Health, New South Wales Department of Public Health. It is written by the Director, Alan Bell, M.B., B.S., D.I.H., and by the Head of the Air Pollution Control Division, John L. Sullivan, Ph.D., M.Sc., A.M.I.Chem.E.

The report is in two parts. In the first, Dr. Sullivan surveys the problem, and the measurements that have been carried out, in the metallurgical town of Port Kembla, on the east coast of Australia. In the second part Dr. Bell reviews the effects on the health of the residents of Port Kembla. The report is in duplicated form, and contains over 200 foolscap size pages, so that it is a substantial volume. Summaries are available, free of charge, from Dr. Alan Bell, at the Division of Occupational Health, 86-88 George Street North, Sydney.

Systematic air pollution measurements were started in Port Kembla in 1953, and have been continued, except for one break, until the present. Initially, the work was limited to the measurement of dust-fall, but in 1927 was extended to include sulphur dioxide and smoke density. As sulphur dioxide presented an obvious problem in part of Port Kembla more emphasis was placed on this gas than on the other contaminants. It was soon found that high concentrations, by urban standards, sometimes occurred. A survey of the respiratory status of the residents in and adjacent to the area was therefore organized, and the results of this study are included in the report.

In the medical survey 947 residents were asked a standardized questionnaire in order to determine the prevalence of chronic bronchitis; in addition smaller numbers of people underwent a pulmonary function and sputum test. Individual findings for the regions of high and low pollution were compared to see if there were any statistically significant differences. The findings are given in some detail, but in summary it is concluded that the respiratory health of residents in the more polluted area is not as good as those living in the other area. As to what causes the difference, Dr. Bell "finds it difficult not to seriously consider . . . sulphur dioxide".

United States

A SURVEY OF A.P. PROBLEMS AND CONTROL PROGRAMMES

The March, 1963, issue of the Journal of the Air Pollution Control Association contains an informative survey, read at the Association's 1962 conference, on "Air Pollution Problems and Control Programmes in the United States". The author is Jean J. Schueneman, of the Division of Air Pollution, U.S. Department of Health, Education and Welfare. The paper contains many important facts and figures, from which only a few can be selected for mention.

308 places in the U.S., with a population of 2,500 or more, are estimated to have a "major" air pollution problem. 43 million people, or 24 per cent of the population live in these areas. Altogether over 100 million people are confronted with air pollution problems of one kind or another. Growing urbanization is increasing the problem: in 1950, 44 millions lived in 14 areas of more than a million population; in 1960, 63 millions were living in 22 such areas. The trend is continuing, and in addition energy consumption is in-

creasing relatively faster than the population, and is expected to double in the next 20 years.

Fuel use patterns are changing, and during the past ten to twenty years the most significant changes have been replacement of oil- and coal-fired railway locomotives with diesels; replacement of coal-fired units; replacement of coal-fired units in domestic and commercial establishments with oil- and natural gas-fired units; and a large increase in the use of coal for electric power generation. In 1950 there were 3,867 electric generating plants which produced 388 x 10^9 kwh, and in 1960 there were 3,457 plants producing 795 x 10^9 kwh. There is a similar increase in production from a smaller number of plants in the case of oil refineries, and thus "more pollution is being discharged at fewer locations, tending to create localized pollution levels which are relatively higher than would be the case with a larger number of smaller plants located apart from each other".

Both state and local air pollution programmes are examined, in detail, and wide variations in control are shown. Thus there were only 17 states with air pollution problems involving expenditure of $5,000 or more, and of $2 millions spent in total by the states in 1961, 57 per cent was spent in California.

Tables of local—that is, county and municipal—agencies show very wide differences in their budgets and in the number of staff on air pollution control. Los Angeles County, at one extreme, has a staff of 373 and a budget of $3.5 millions; Wayne County, Michigan, at the other extreme, with a population of over 2½ millions, has a staff of 1.5 and a budget of $20,000.

Mr. Schueneman considers that much more should be done to improve the situation, and makes a number of observations about the future: the need for more public support, federal grants to provide financial support for state and local programmes to "get the ball rolling", and the promotion of joint action by the local authorities and of interstate action when pollution problems are common to two or more states. He continues:

"The nature of the problem, in many areas, has changed from one of visible smoke emissions to one associated with a variety of pollutant emissions (including smoke), photochemical smog or otherwise. Today's problems require a knowledge of atmospheric pollution levels and of all the sources of pollution. This means that air pollution measurements should be made and pollutant emission inventories should be prepared. With these in hand, and with a variety of other knowledge, a programme of air resource management can be developed for today and for the future."

U.S. Publications

So many publications and papers on air pollution have been received recently from the U.S.A. that brief reference only can be made to them. First are two well-produced pamphlets issued by the U.S. Public Health Service. *Air Pollution, a National Problem*, after a brief and graphically illustrated statement of the question, gives state maps that show the localities where pollution exists, with symbols denoting cities and the industrial processes responsible. The only state without such a black mark is Alaska, with Vermont as runner-up, with just one cement or lime plant.

In *Troubled Air*, the U.S. Department of Health explains the problem in 28 pages of excellent charts, showing the origins, localities, and effects of pollution. This is a first-class propaganda publication. Another pamphlet is *The Federal Role in Air Pollution*, which is based on a speech by Vernon G. MacKenzie. Of a more technical character, from the same department is a 50 page booklet on *Engine Modifications and Exhaust Emission Control: A Survey and Appraisal.*

The Air Resources of Kansas is a report on the pollution problem in that state prepared jointly by the

Kansas State Board of Health and the Division of Air Pollution of the Public Health Service. It reports on a survey made, and gives recommendations for the abatement of existing pollution and the prevention of future contamination.

Reprints of a number of papers in U.S. journals that have been received include *Carcinogenic Biossays on Air Pollutants*, by W. C. Hueper, *et al* (J. Arch. Pathology, Aug. 1962); *The Automotive Exhaust Problem: Its Relation To Health*, by D. Hofreuter (Arch. Env. Health, May, 1961); *National Air Sampling Network Measurement of SO_2 and NO_2*, by W. H. Perry and Elbert C. Taylor (Arch. Env. Health, March, 1962) and *Variation of Carbon Monoxide Concentrations as Related to Sampling Interval, Traffic, and Meteorological Factors*, by R. A. McCormick and C. Xintaras (J. Appl. Met., June, 1962).

West Germany

DUST

A conference organized by the Dust Technology Group of the V.D.I. on new developments in dust arrestment technology was held in Berlin from June 11 to 13. We hope to report on this meeting more fully in our next issue.

France

CLEAN AIR AWARDS

In order to promote research into methods for suppressing or reducing atmospheric and water pollution caused by chemical and petroleum chemical establishments, the French Minister of Industry has instituted two annual prizes.

A prize of F.10,000 will be offered for the discovery of an effective anti-pollution process or equipment. There will also be a prize of F.5,000 for the best published paper concerned with the application of existing legislation or techniques in dealing with industrial pollutions.

The Air of Paris

Dr. Bernard Lafay, former French Health Minister, says that the proportion of deaths due to bronchitis in Paris in recent years has risen to the same level as in London.

He told the City's Municipal Council that air pollution was increasing so rapidly in the city that "any day it could become catastrophic".

Deaths from lung cancer in the city doubled between 1950 and 1961. In 40 years the number of foggy days had almost doubled, and hours of sunshine had fallen by 25 per cent.

South Africa

JOHANNESBURG CAMPAIGN

Johannesburg's battle against smog will move into top gear today.

The city's first clean air consultative committee will be launched this morning before industrial and health experts.

It will be headed by the chairman of the Health and Amenities Committee, Mr. Alf Widman, and will act as advisory committee on air pollution control.

It will also promote liaison between the City Council, industry and suppliers and users of fuel.

"We plan an intensive educational programme on the uses of smokeless fuel", said Mr. Widman yesterday.

The council last month laid down that the central city area will become a smokeless zone as soon as proposed legislation is passed.—*Rand Daily Mail, March 20, 1963.*

"Cleaner Air Through Understanding and Co-operation" is the theme of this year's conference of the Air Pollution Control Association, being held at Detroit from June 9 to 13.

U.S. industry is spending £178,570,000 a year on air pollution control, states the U.S. National Association of Manufacturers.

Electricity in Scotland

Annual Report and Accounts of North of Scotland Hydro-electric Board, 1962. Annual Report and Accounts of South of Scotland Electricity Board, 1962. Each 5s. 6d. net. H.M.S.O.

ELECTRIC plant capacity in Scotland continues to expand, and the output from both the North of Scotland Hydro-electric Board and the South of Scotland Electricity Board increased during the year by some 15 per cent.

Both Boards depend on thermal and hydro-electric generation, but in very different proportions. The Northern Board's plant on the mainland comprises 51 hydro-electric stations—including six opened during the year—of 957,662 kW, two steam stations of 132,875 kW and in the outer isles diesel plant of 43,657 kW. The Southern Board's plant comprises 12 steam stations of 2,032,000 kW and 7 hydro-electric stations of 123,000 kW.

The North of Scotland Board during the year sold 2,058 million units to 406,827 consumers at an average price of 1·721d. per unit, which together with services and sales of fittings produced a revenue of £18,645,267 and a net surplus of £1,472,996 bringing accumulated reserves to £2,629,526.

The South of Scotland Board sold 9,335 million units to 1,387,767 consumers at an average price of 1·544d. per unit, producing with contracting and sales of fittings a gross revenue of £66,134,000 and a net surplus of £1,780,000.

The North of Scotland Board has under construction an additional 489,396 kW of hydro electric plant including the Cruachan pumped-storage station designed to contain four 100,000 kW generators. An additional 641,800 kW of hydro-electric plant is under survey. Orders have been placed for two additional steam sets of 120 MW for the Dundee station of which the first should be in commission by 1965.

The maximum demand on the mainland system was 618,000 kW. Of the 2,829 million units generated by the North of Scotland Board 2,618 million units came from hydro-electric plant. Sales of electricity to the South of Scotland Board totalled 572 million units and purchases of off-peak energy from them amounted to 200 million units. The average cost per unit from all sources was ·7632d. 6,647 additional consumers were connected during the year of which some 1,000 were uneconomic. The Board has under consideration financial plans for the extension of the system into more remote areas.

During the year under review the rainfall in the North of Scotland was erratic ranging from 140 per cent of the average in some places to as low as 46 per cent of the average in others. Over the whole year the total rainfall was 108 per cent of the average.

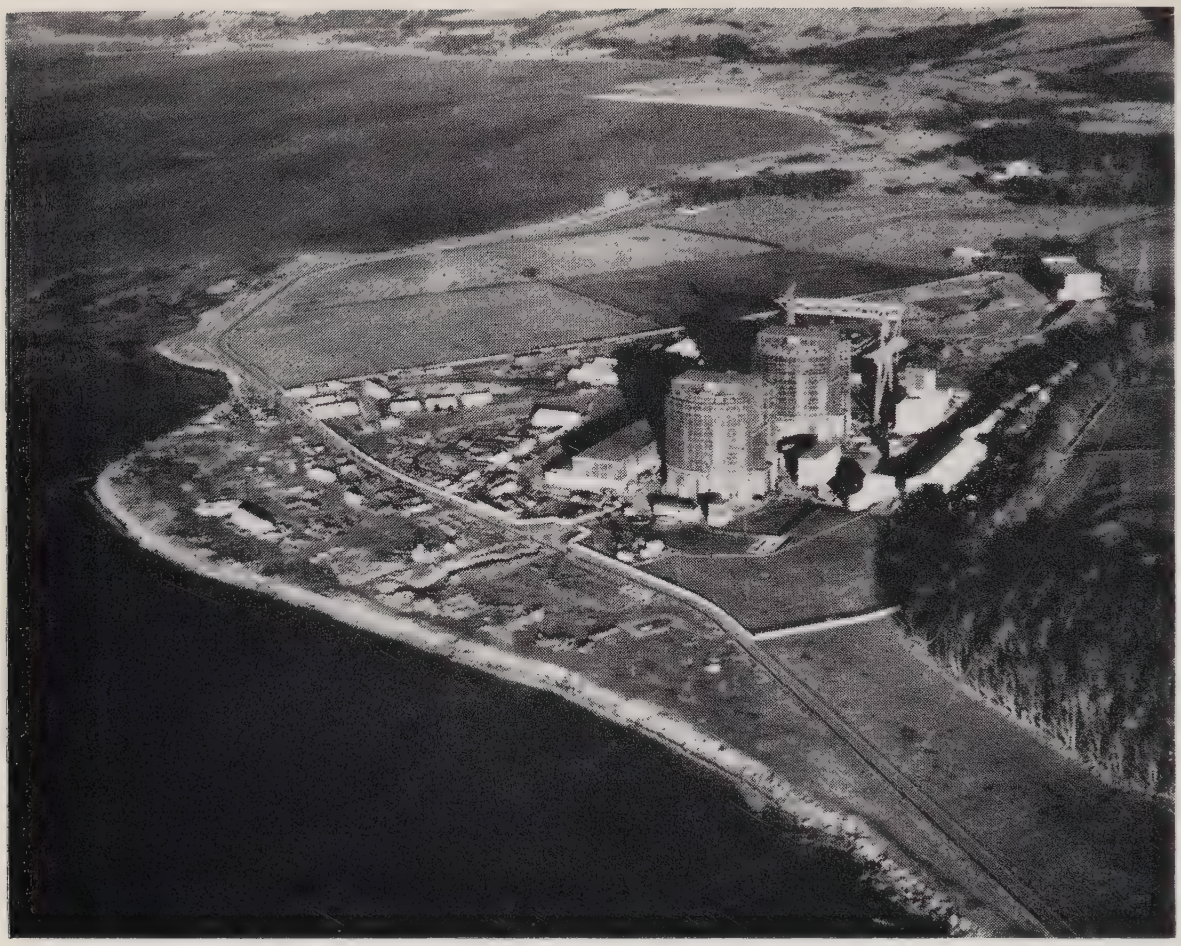
The 8 diesel stations in the Isles generated 76 million units.

The mainland transmission systems at the end of the year amounted to 1,945 circuit miles operated at 132 kV and of the new 275 kV system 75 miles is completed and operated at 132 kV. During the year 16 line faults were attributed to gales and 25 to lightning.

During the year 63 electric driers were installed, among these 6 dual-purpose driers for grain or baled hay.

Capital expenditure of the Board during the year amounted to £13,109,511 of which £5,889,650 or 44·9 per cent was met from internal resources.

The South of Scotland Board's



The Hunterston Nuclear Power Station

steam plant was reinforced by the commissioning during December of a generating set of 200,000 kW making with the three 120,000 kW sets a total installed capacity of 560,000 kW. The new set operates at 2,350 lbs. per sq. inch, at 1,050°F. and reheats to 1,000° F. The stator is water cooled and the rotor is cooled by hydrogen at 50 lbs. to the sq. inch.

Thermal efficiency of generation (including the slurry-fired station at Barony) was 27·79 per cent, compared with 24·74 per cent in 1955. The thermal efficiency of Kincardine was 34·46 per cent.

Hydro-electric stations in Galloway and Lanarkshire produced 323 million units. The nuclear power station at Hunterston progressed and loading with uranium fuel is expected to commence in November 1963.

A new steam station is being erected at Cockenzie to comprise four 300,000 kW generating sets. Ash from this station will be pumped through pipes to the foreshore at Musselburgh. Work was commenced also on a new slurry-burning station at Methil to contain two 30,000 kW sets.

The maximum demand on the system occurred on November 22, 1962, between 5.30 p.m. and 6 p.m., amounting to 2,451,000 kW, an increase of 2 per cent. 97·1 per cent of the Board's plant capacity was available, an additional 3·8 per cent was obtained by overload, 307,000kW was imported from the North of Scotland Board, 183,000 kW from the Atomic Energy Authority's nuclear plant at Chapelcross and 137,000kW from the Central Electricity Generating Board.

The load factor of the system was 48·4 per cent compared with 43·3 per cent in the previous year.

The Board's thermal stations consumed 4,413,116 tons of coal (including 374,486 tons of washery slurry) and 497 tons of coke breeze all from Scottish sources, and 4,289 tons of coal from England. The cost of coal has risen from 76s. 7d. a ton to 106s. 11d. a ton since 1955.

The 275,000 volt transmission system is being extended and agreement has been reached with the Central Electricity Generating Board for a 275,000 volt double circuit connection from the new Cockenzie Station to Stella near Newcastle.

The Board's support for Scottish industry is exemplified by the placing during the year of contracts for plant to the value of £28 million with Scottish manufacturers or suppliers.

Off-peak use of electricity was 52·9 per cent higher than during 1961. There are now 13,657 premises with floor-heating and 13,507 kW of block storage heaters. Off-peak installations amount to 635,562 kW.

Capital expenditure amounted to £37·54 million of which 27·2 per cent was furnished from internal resources.

The report includes as an appendix the report for 1962 of the Electricity Consultative Council for the North of Scotland District. This is of particular interest as it records the strong opposition of the Council to some of the recommendations of the Departmental Committee on the Generation and Distribution of Electricity in Scotland (the "Mackenzie Committee"). The principal recommendation of this committee was a complete merger of the Hydro Board with the South of Scotland Board and the fusion of the two consultative councils. This is regarded with deep concern, as is also the recommendation for a uniform tariff for the whole of Scotland. It is felt that an amalgamation "would be bound to result in the subordination of the interests of the North to those of the South". It is pointed out that "the Hydro Board have connected over 90 per cent of the consumers in their district, that, despite the most adverse conditions, they have succeeded in doing so in fifteen years and that they are at the moment free of debt with a surplus in reserve".—*A.J.C.*

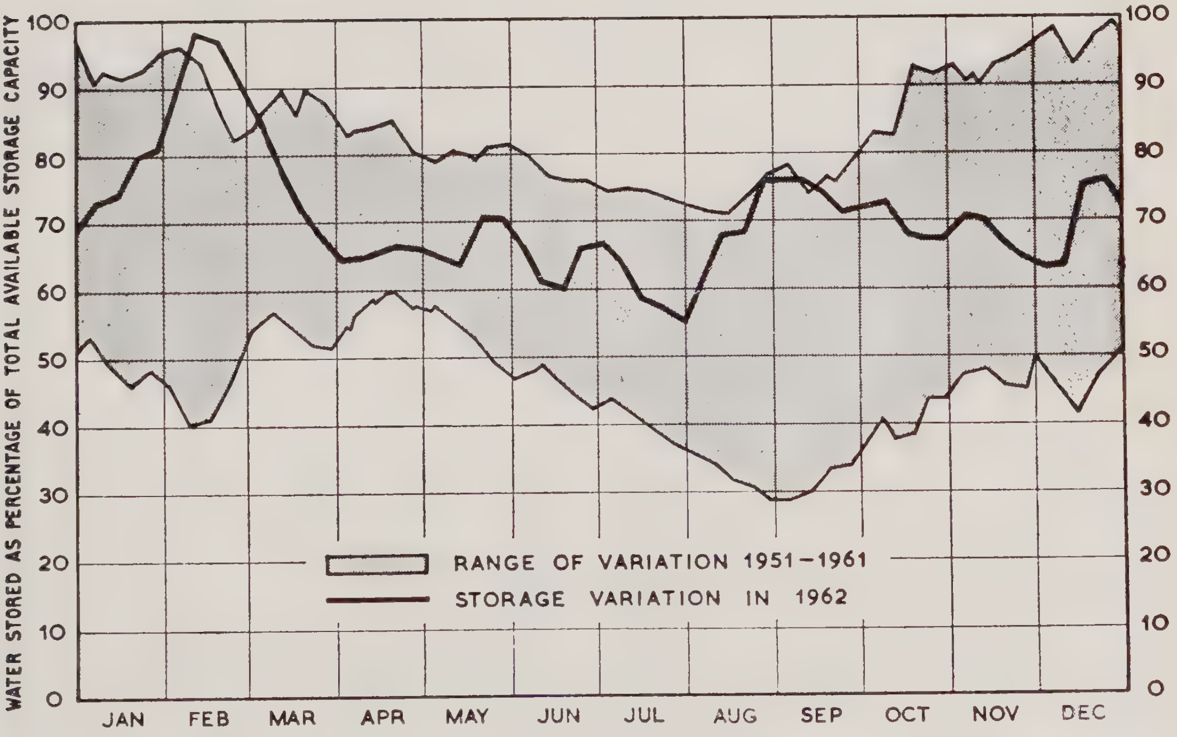


Chart from the Hydro Board's report showing the wide variations in water availability

Underground Storage of Gas

by Sir Henry Jones

News of possible underground formations which could store vast quantities of gas to meet peak winter demands was given in London recently (Monday, March 18) by the Chairman of the Gas Council, Sir Henry Jones.

He told a meeting of engineers: "In Great Britain formations are known which could be used for gas storage and the Gas Council is prospecting for more."

Sir Henry was speaking at a joint meeting of members of the Institution of Civil Engineers and the Institution of Gas Engineers on "The Storage of gas underground in aquifers."

He said that in its search in Oxfordshire and Midland counties reaching from Stow-on-the-Wold across Norfolk, the Council had already located possible storage formations, but exploration was not yet far enough advanced for them to be defined precisely.

"Possible sites in Yorkshire and Scotland are being considered, but again none has been closely examined," he said. "At Cousland (Midlothian) and in the area around Chesterfield, Doncaster and Nottingham, modest supplies of natural gas have been found which, when exhausted, may leave available worthwhile storage areas."

"A structure at Chilcomb, near Winchester, has been the subject of considerable comment because the Council, in 1961, promoted a Bill in Parliament in order to obtain powers to store gas there. But the Bill was later withdrawn."

He said the gas industry needed underground storage for peak load gas and this could be town gas ready for use, or natural gas.

"The storage of natural gas on a sufficient scale would also provide a strategic reserve against any interruption to supplies," added Sir Henry.

"No Risk"

"Provided the work of exploration is thorough, and the development of a site is properly engineered, gas can be stored underground with no risk to surface owners and occupiers or to water supplies."

Sir Henry emphasized that the technique of underground storage was novel in this country and the ways in which a storage system was developed and operated had not, hitherto, been widely known, with the result that many objections appeared to have sprung from a lack of understanding.

It had been estimated, he said, that for a hypothetical storage system costing about £3 million the annual savings would be about £770,000.

Suitable underground storage areas consisted of porous rock some 500 to 2,000 ft. below the surface with an impervious cap-rock, which could vary in thickness from 20 ft. to 200 ft. or more.

Sir Henry said there would be few surface installations, for much of the equipment could be installed in a chamber under the ground.

There were more than 200 gas storage areas in use throughout the world. For Great Britain about six storage systems would be sufficient to level the rate of gas supply over the year.

Sir Henry concluded: "The development of a wider body of informed opinion is highly desirable and it is to be hoped that a full and frank discussion of the many aspects of the underground storage of gas will help to spread more widely knowledge of this subject."

Smut Emission

By C. A. ROAST, A.M.I.Mech.E., A.M.I.E.E., M.Inst.F.*

The reason for the emission of smuts from an oil-fired industrial boiler installation was investigated. The work revealed that air ingress to the flueway system from expansion joints, the closed damper of a standby boiler and a draught stabilizer were sufficient to depress the chimney gas temperature below that of the acid dewpoint and so cause smut emission. It was also established that the draught stabilizer served no useful purpose. The test data illustrate how certain methods of reporting SO_3 concentrations and particulate matter (stack solids) are liable to misinterpretation.

1. Introduction

IT has been shown that where mild steel chimneys are employed with oil-fired boilers smut emission can be prevented by raising the temperature of the metal surfaces above about 250°F. (121°C.). This elevation of metal temperature can be achieved by surrounding the chimney with a suitable aluminium casing. With gas temperatures below 400°F. (204°C.) this method would probably be effective in varying degrees depending upon certain factors, but in all cases it should bring about some improvement.[1]

Where a high standard of thermal efficiency is maintained, or where periodic part loading of the boiler is inevitable, it will be necessary to restrict flueway air dilution, to a minimum, if the temperature of the gases entering the chimney is to be in excess of 350°F. (177°C.).

The following case history illustrates how flueway system air dilution can contribute to the emission of acid-laden agglomerates.

2. Plant Details

Fig. 1 shows the layout of the plant. There are two triple-pass Economic boilers each rated at 10,000 lb. of steam per hour at a pressure of 100 p.s.i. Each boiler has a constant-speed ID fan with additional facilities for part boiler loading on natural draught in case an electrical power failure should occur. A draught stabilizer is fitted to that section of the main flue ducting directly connected to the chimney. This part of the ducting, which has a cross-sectional area of 11·5 ft.^{2}, was unlagged. The chimney is constructed of brick with an uncooled fire-brick lining and a cavity of 1·5 in. The chimney height is 70 ft. and the diameter at the top is 4·2 ft.

Fuel-handling facilities include a small electric pump and heater for starting, with the usual steam-fed units which are brought into commission when sufficient steam pressure is available.

Straight pressure-jet burners having a maximum operating pressure of 200 p.s.i. are employed for the 2,000-s (Redwood No. 1 at 100°F.) fuel which contains 3·7 per cent of sulphur and 0·03 per cent by weight of ash.

Whilst there is adequate instrumentation for determining carbon dioxide, gas temperature and furnace draughts, there is no direct means of establishing the rate of evaporation.

3. Boiler loading and boilerhouse procedure

The industrial steam load varied from about 3,000 to 7,000 lb/h between 8 a.m. and 5 p.m. for five days a week, to which must be added a domestic hot-water supply and space-heating to a minimum temperature of 60°F. for a 168-h week, throughout the whole of the year. For at least ten months of the year one boiler is capable of carrying the entire system load, but it was customary to flash up

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* Technical Sales Department, Esso Petroleum Company, Limited. The article is reprinted, with acknowledgments, from the Journal of the Institute of Fuel, March, 1963.

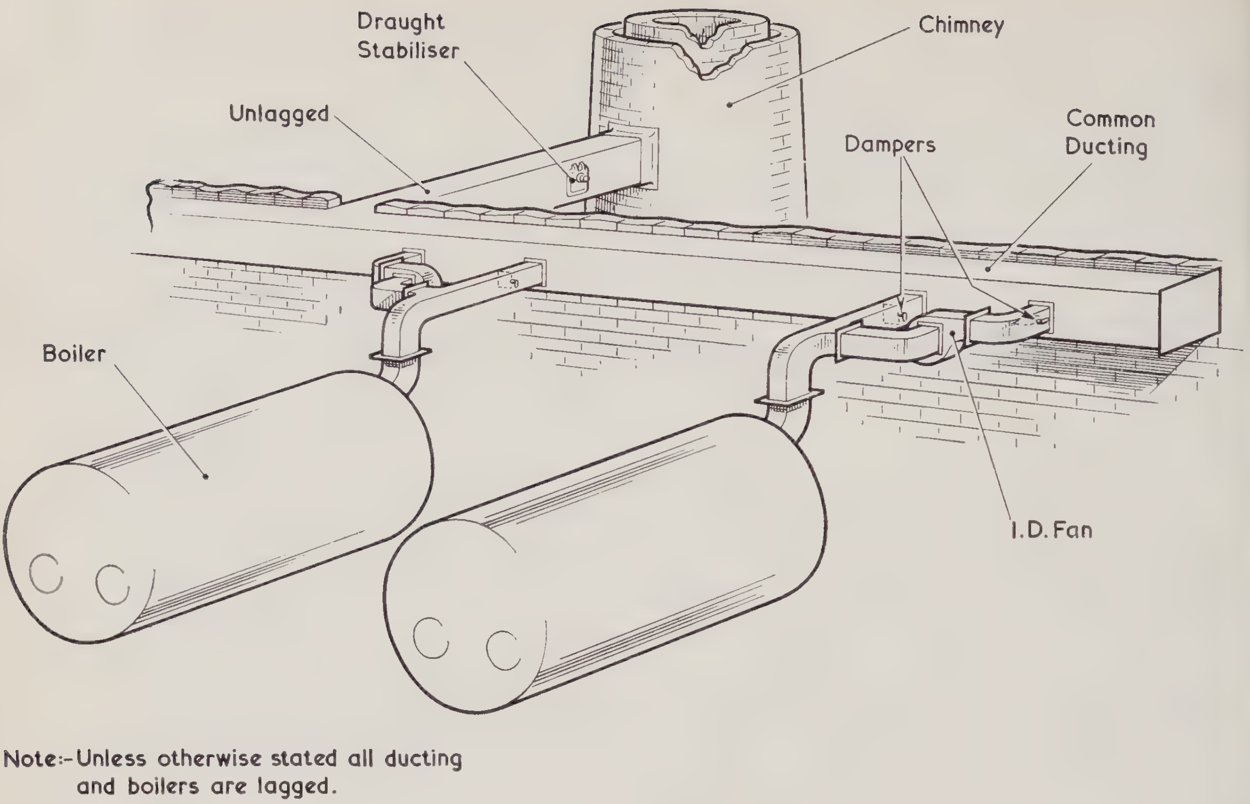

Fig. 1—Layout of the plant

the standby boiler three or four times a day to ensure that it was available for immediate service should the working boiler prove inadequate for the system load, or have to be taken out of commission for any reason.

The steam pressure gauge was the sole means of indicating any variation in the steam flow rate. Consequently, an increase in pressure suggested to the fireman that the demand had decreased and he reduced his fuel oil-pumping pressure in preference to replacing the burner nozzles with units having smaller orifices. He was unaware of the influence of fuel pressure on oil-droplet size and, therefore, not in a position to recognize any adverse trend on unburnt carbon burden arising from too low an oil pressure and/or from less complete oil/air mixing.

The periodic flashing up of the standby boiler was accompanied by the production of heavy smoke for about 20 seconds and by an increase in the emission rate of unburnt carbon and other particulate matter.

Throughout the whole period of two years following the commissioning of this plant, there were frequent complaints of smut emission. This form of nuisance was at its worst on Monday mornings when the oncoming industrial load, after a week-end shutdown, was encountered.

4. Test procedure

After a study of the plant history and having been informed that two previous separate attempts to abate this nuisance had failed, it became apparent that a detailed investigation was required. Fig. 2 shows the sampling points chosen and Table 1 gives an average of the data derived from the first series of tests which, like all others, was carried out during normal boiler operation without any attempt to influence the standard method of firing or rate of steam production.

The next test undertaken was an endeavour to establish the extent to which air ingress through the draught stabilizer was contributing to the low chimney gas temperature.

TABLE 1.—DRAUGHT STABILIZER IN NORMAL SERVICE: DATA DERIVED FROM FIRST SERIES OF TESTS.

	Test point (*see Fig.* 2)		
	(*a*)	(*b*)	(*c*)
CO_2 per cent ..	8	5	2·5
O_2 per cent	11·2	14	17·5
Wt. of gas/lb. of fuel burnt (lb.) ..	27	43	80
Gas temperature, °F.	428	375	220
SO_3 ppm	10		2
Smoke number (Bacharach) ..	2		

The stabilizer was sealed in the closed position and derived data (averages) are shown in Table 2.

TABLE 2.—DRAUGHT STABILIZER SHUT

	Test point		
	(*a*)	(*b*)	(*c*)
CO_2 per cent ..	7·5		4·1
O_2 per cent	11·2		15·8
Wt. of gas/lb. of fuel burnt (lb.) ..	29		51
Gas temperature, °F.	488		295
SO_3 ppm	10		4
Smoke number (Bacharach) ..	2		

It will be noted that the draught stabilizer was apparently responsible for approximately 29 lb. of air ingress per lb. of fuel burnt into the flueway system and this accounted for a drop in gas temperature of about 75°F.

Concurrent with this second series of tests were measurements of particulate matter at position (*d*) as shown in Fig. 2. Isokinetic sampling methods were used and the average burden was found to be 0·011 grammes per minute, or 0·034 grains per ft.^{3} at N.T.P. A percentage analysis of the particulate matter is given in Table 3.

TABLE 3.—PERCENTAGE ANALYSIS OF GAS-BORNE PARTICULATE MATTER:

SAMPLE FROM POSITION (*d*) (SEE FIG. 2)

Vanadium as V_2O_5	9·55
Iron as Fe_2O_3	0·38
Nickel as NiO	0·85
Sodium as Na_2O	15·82
Calcium as CaO	0·31
Magnesium as MgO	0·70
Sulphate	20·77
Carbon	51·00
pH value	2·90

A heat balance assessment of applicable data derived from these tests indicated that any instrument error was reasonably within the tolerance range for field trials of this nature.

The test report to the plant owners included the following recommendations:

(1) Permanent sealing of the draught stabilizer.
(2) Reduction of air ingress through the standby boiler.
(3) Restriction of air ingress through ducting expansion joints and particularly in the ID fan zone.
(4) Provision of some direct indication of rate of steam flow to the system.
(5) Insulation of the chimney ducting.
(6) Restriction of standby boiler flash up from four times to once a day.
(7) Arrangement of a training course whereby the firemen can be provided with some basic knowledge in the handling and efficient use of liquid fuel.

All recommendations, with the exception of No. 2, were implemented, and throughout the following six months there were no complaints of smut emission. At this stage a check on operating conditions was made and gave the data shown in Table 4.

TABLE 4.—DRAUGHT STABILIZER PERMANENTLY SHUT

	Test points		
	(*a*)	(*b*)	(*c*)
CO_2 per cent ..	9·6	8·1	5·4
O_2 per cent	8·5	10·4	14·2
Wt. of gas/lb. of fuel burnt (lb.) ..	23	27	40
Gas temperature, °F.	500	435	310
Smoke number (Bacharach) ..	2		

5. Observations

The effect of the draught stabilizer as a normal operating unit was to admit to the chimney about 29 lb. of air per lb. of fuel burnt. With an average boiler firing rate of 500 lb. of fuel per hour air ingress through the stabilizer was about 14,500 lb/h. This had the effect of depressing the chimney gas temperature well below that of the acid dewpoint. The uncooled cavity provided for the refractory lining of the chimney may have had some beneficial influence on the severity of smut emission; it would not, however, in such circumstances prevent the nuisance. The permanent sealing of the stabilizer revealed that this piece of equipment served no useful purpose; the ID fan provided all the draught control necessary.

Part of the 4 lb. of air ingress shown in Table 4 between the boiler outlet and the discharge side of the ID fan, is accounted for by a design requirement of air cooling to the fan bearings.

The current 13 lb. of air ingress to the ducting system between the ID fan discharge and the chimney entry is almost entirely due to leakage through the standby boiler air directors, the ID fan and the 10 per cent free area left by the damper in its shut position. This installation is typical of many others, and once again illustrates a necessity to install fully closing dampers. In order to satisfy insurance company requirements with respect to safety hazards when lighting up the boiler, an interlocking device can be installed in such a manner as to prevent fuel flowing to the oil burner when the damper is closed.

The method adopted by the author on this occasion for recording sulphur trioxide concentrations is for the purpose of illustrating its weakness. The reporting of SO_3 in parts per million can be most misleading unless due regard is given to the weight of gases including any air dilution. From Tables 1 and 2 it could be erroneously assumed that there was a marked decrease of SO_3 between the boiler outlet and the chimney; a calculation will reveal that other than perhaps for some very slight loss due to condensation, the actual weight of SO_3 is the same at the boiler outlet and the entrance to the chimney.

A method of reporting gaseous SO_3 used by some investigators is:

$$\text{Percentage oxidation } \frac{SO_3}{SO_2+SO_3} \times 10^2$$

The author prefers to record the total weight of gaseous SO_3 on an hourly or fuel weight basis. Field experience indicates that it would be unwise to assume that the incidence of smut emission in temperature critical flueway and chimney systems is solely a function of the weight of SO_3 in the

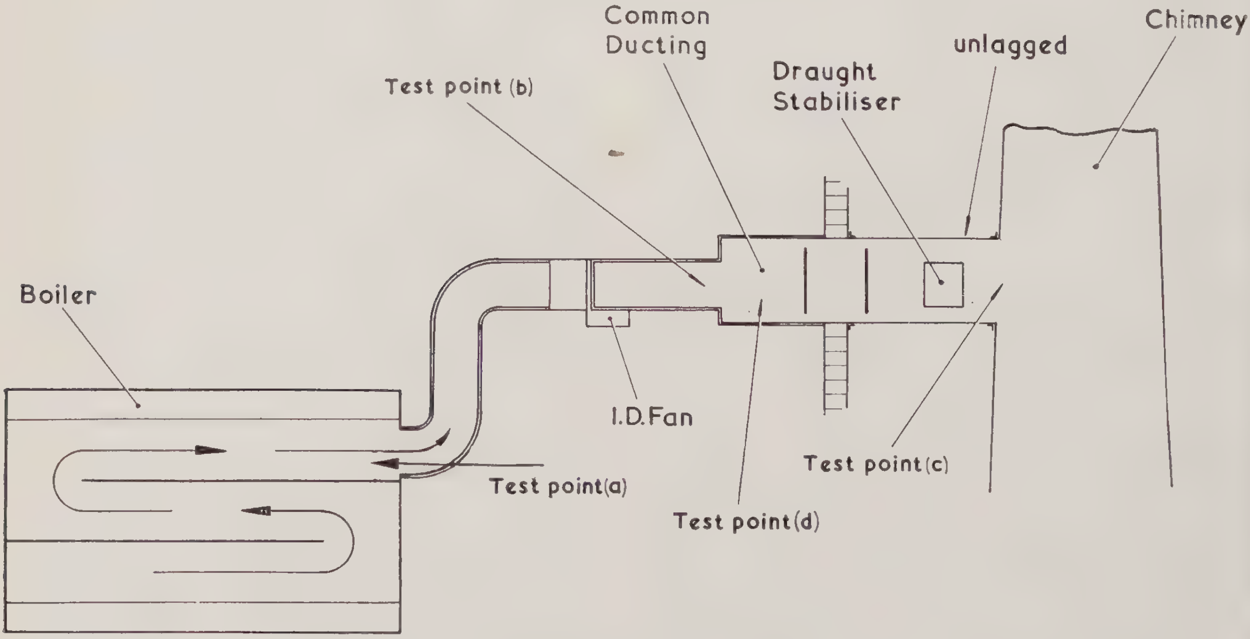

Fig. 2—Position of the sampling points

gases. For example, the author has found smuts being emitted with 1 or 2 ppm at the base of the chimney. In some such instances the weight of gas leaving the boiler per lb. of fuel burnt has been in excess of 50 lb., whereas in others it has been less than 25 lb. Another important factor influencing the smut emission is the cooling of the flueway system during the "off" period with fully automatic on/off burners.

Some methods of reporting measurements of gas-borne particulate matter or "stack solids" can also be misleading. For example, if the measured burden at test point (*c*) (see Fig. 2) shows 0·03 grains per ft^3 at N.T.P., a calculation is necessary to establish the actual weight on an hourly or fuel poundage basis. On the assumption that there was no deposition in the flueways, the burden at the boiler outlet should be 0·052 grains per ft^3 under the operating conditions shown in Table 4. The deposit analysis in Table 3 shows 51 per cent of unburnt carbon; when compared with an unburnt carbon of 70 to 80 per cent at some other installations the indications are that a reasonable degree of atomization and fuel "burn out" was being maintained.

Isokinetic flue-gas solid measurements are obviously preferred, they are most useful for the ultimate assessment of the completeness of combustion and for obtaining an indication of particulate emission from the chimney. The test points must, however, be carefully chosen. For assessing burner performance, the nearer the combustion chamber the better, hence, for a water-tube boiler, sampling is best when using a probe located in the superheater zone. For an Economic boiler the end of the second pass is generally preferred.

In any attempt to measure the particulate emission from a chimney in terms of public nuisance, the nearer the test point is to the chimney top the better. Unfortunately, this is not always possible, and in consequence the next best chimney position is one sufficiently far away from the ducting entrance to avoid stratification.

6. Conclusions

The basic cause of smut emission at this installation was considerable air dilution depressing the chimney-gas temperature below that of the acid dewpoint. The draught stabilizer, which was responsible for about 40 per cent of the air dilution, served no useful purpose. The work reveals that there is a necessity to test ducting expansion joints in flueway systems periodically so that unnecessary air ingress is restricted to a minimum. For multi-unit installations it is necessary to install dampers capable of providing a reasonably gas-tight seal to non-steaming boilers.

7. References

1. Blum, H. A., Lees, B., and Rendle, L. K. Prevention of Steel Stack Corrosion and Smut Emission with Oil-fired Boilers. *J. Inst. Fuel*, 1959 (April), **32,** 165.

Domestic Coal Consumers' Council

The Council has made a detailed and balanced report to the Minister of Power on the controversial report on smokeless fuels published in Shopper's Guide in May, 1962, and discussed in a B.B.C. television programme "Choice".

Although welcoming the Consumer Advisory Council's initiative in carrying out the survey, and saying that as far as they are aware this was the first independent survey directed to finding out, by physical tests of actual deliveries, the quality of solid smokeless fuels, the report to the Minister goes on: "As is made clear later in this report, we also endorse some of the advice which the Consumer Advisory Council gives to consumers in the light of its findings. We cannot however accept the report as an accurate or wholly fair reflection of the present state of affairs in regard to solid smokeless fuels."

The report continues by giving in some detail the principal reasons for reaching this conclusion.

SMOKE CONTROL AREAS

Progress Report

POSITION TO APRIL 1, 1963—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation Acres, 3,400 Premises, 41,060	44	1
Smoke Control Areas in Operation . . . . Acres, 178,193 Premises, 991,101	897	30
Smoke Control Orders—		
Confirmed	334	9
Submitted	133	7
Grand Totals	1,408	47

The lists below are supplementary to the information in the last issue of Smokeless Air (Spring, 1963) which gave the position up to January 1, 1963. They now show the changes and additions to April 1, 1963.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Areas in Operation

Blackburn C.B. No. 2, Halesowen B Nos. 13 and 14, Marple U.D. No. 1, Stockport C.B. No. 4, Wakefield C.B. No. 5, Willenhall U.D. No. 14, Wilmslow U.D. No. 9, Winsford U.D. No. 2.

New Orders Confirmed but not yet in Operation

Aireborough U.D. Nos. 12 and 13, Aldridge U.D. No. 17, Barking B. No. 4, Beckenham B. No. 2, Bexley B. No. 1, Birmingham C.B. Nos. 81 to 84, 86 to 88, Brighouse B. No. 8, Brierley Hill U.D. Nos. 12 to 14, *Burnley C.B. No. 2, Camberwell B. Nos. 4 and 5, Cheshunt U.D. No. 3, Coventry C.B. No. 4, Crawley U.D. No. 4, Dagenham B. No. 5, Dukinfield B. No. 5, Eccles B. No. 5, *Ealing B. No. 12, Ealing B. No. 13, East Barnet U.D. No. 4, Finchley B. No. 8, Finsbury M.B. No. 4, Friern Barnet U.D. Nos. 3 and 4, Fulham M.B. No. 7, Grantham B. No. 7, Hackney M.B. No. 6, Halesowen B. No. 18, Hampstead B. No. 5, Harrow B. No. 5, Hendon B. No. 6, Hornchurch U.D. No. 5, Hornsey B. No. 5, Ilford B. No. 4, Keighley B. No. 3, Kingston-upon-Hull C.B. No. 10, Lambeth M.B. No. 6, Leyton B. No. 3, *Liverpool C.B. Nos. 14 and 15, Manchester C.B. No. 7, Mirfield U.D. No. 5, Morley B. No. 21, Padiham U.D. Nos. 5 and 6, *Penge U.D. No. 2, *Preston C.B. No. 6, Queensbury & Shelf U.D. No. 2, Radcliffe B. No. 3, Rotherham C.B. Nos. 12 and 13, Rothwell U.D. Nos. 1 and 2, Royton U.D. No. 3, *Runcorn U.D. No. 2, Sale B. No. 4, *Sedgley U.D. No. 7, Seisdon R.D. No. 1, Skipton U.D.

No. 1, Slough B. No. 4, Southall B. No. 5, Stanley U.D. No. 1, (Durham), Stepney M.B. No. 4, Stockport C.B. No. 5, *Stourbridge B. No. 1, Stourbridge B. Nos. 2 to 6, *Stourbridge B. No. 7, Stourbridge B. No. 8, *Stourbridge B. No. 9, Stourbridge B. Nos. 10 to 17, Tottenham B. No. 4, Warrington C.B. No. 6, *Wimbledon B. No. 1, Wembley B. Nos. 7 and 8, Wigan C.B. No. 3, Willenhall U.D. No. 15, Winsford U.D. Nos. 4 to 7, Wood Green B. No. 5, Woolwich M.B. Nos. 16 to 18.

New Orders Submitted for Confirmation but not yet Confirmed

Acton B. Nos. 6 and 7, Audenshaw U.D. No. 3, Aylesbury B. No. 1, Barking B. No. 5, Batley B. No. 3, *Beeston & Stapleford U.D. No. 3, Bethnal Green M.B. Nos. 4 and 5, Billingham U.D. No. 2, Birkenhead C.B. No. 3, Birmingham C.B. 34, *Birmingham C.B. No. 85, Birmingham C.B. Nos. 89 to 94, Blaby R.D. No. 2, Blaydon U.D. No. 3, Bolton C.B. No. 20, Bootle C.B. No. 5, Bredbury & Romily U.D. No. 3, *Bristol C.B. No. 6, Bromley B. No. 5, Burnley C.B. Nos. 4 to 6, *Chadderton U.D. No. 5, Chadderton U.D. No. 6, Chingford B. No. 3, Coventry C.B. No. 5, Crayford U.D. No. 2, Croydon C.B. No. 5, Derby C.B. Nos. 4 and 5, Dewsbury C.B. No. 5, Dukinfield B. No. 4, Eccles B. No. 6, Elland U.D. Nos. 1 to 3, Enfield B. No. 4, Eston U.D. No. 1, Failsworth U.D. No. 3, Gateshead C.B. No. 5, Gillingham B. No. 2, Glanford Brigg R.D. No. 2, Great Harwood U.D. No. 1, Halesowen B. Nos. 4 and 19, Halifax C.B. No. 7, Hammersmith M.B. No. 5, *Harlow U.D. No. 2, Harlow U.D. No. 3, Harrow B. No. 6, Heywood B. No. 4, Hindley U.D. No. 2, *Huddersfield C.B. No. 6, Huddersfield C.B. No. 7, Hyde B. No. 4, Ilford B. No. 5, Islington M.B. Nos. 11 and 12, Lambeth M.B. B. 3, Leamington Spa B. Nos. 9 and 10, Liverpool C.B. No. 16, Malden & Coombe B. No. 4, Manchester C.B. No. 8, Mansfield B. No. 3, Middleton B. No. 9, Mitcham B. No. 1, Mold U.D. No. 1, (Wales), Morley B. Nos. 22 to 24 and 26, Newcastle-under-Lyme B. No. 3, Newcastle-upon-Tyne C.B. Nos. 8 to 10, Newton-le-Willows U.D. Nos. 1 and 2, Nottingham C.B. No. 4, Nuneaton B. No. 8, Oldham C.B. No. 5, Ossett B Nos. 5 and 6, *Paddington M.B. No. 4, Prestwich B. No. 6B, Reading C.B. No. 8, Rochdale C.B. No. 5, Romford B. Nos. 1 and 2, Scunthorpe B. No. 4, Sedgley U.D. No. 8, Shoreditch M.B. No. 5, Slough B. No. 5, Southampton C.B. No. 2, Spenborough B. No. 4, Staines U.D. No. 4, Stockport C.B. No. 6, Stoke-on-Trent C.B. No. 11, Stourbridge B. No. 18, Stretford B. No. 4, Sunderland C.B. No. 6, Sutton in Ashfield U.D. No. 1, Swinton & Pendlebury B. No. 3, Tynemouth C.B. Nos. 1 to 7, Urmston U.D. No. 3, Wakefield C.B. No. 7, Wandsworth M.B. No. 5, Watford B. No. 3, Wath-upon-Dearne U.D. No. 2, Wednesfield U.D. No. 5, *West Hartlepool C.B. No. 1, Westminster M.B. Nos. 10 to 13, *Wetherby R.D. No. 1, Whitley Bay No. 1, Widnes B. No. 3, Willesden B. No. 5, Yiewsley & West Drayton U.D. No. 4.

SCOTLAND

New Smoke Control Orders Confirmed but not yet in Operation

Clydebank No. 3, Edinburgh (Corstophine No. 1), Paisley (Glenburn).

New Smoke Control Orders Submitted for Confirmation but not yet Confirmed

Dumbarton Burgh No 5

Lucas Develop Exhaust Purifier

A rigorous road test programme is now being conducted by Lucas on its exhaust gas purifier, the "Detoxer".

In this unit the exhaust gas stream passes through one side of a heat exchanger, mixes with air supplied by an engine-driven pump, is ignited by a continuously operating spark plug, burns the contaminence, travels through the other side of the heat exchanger and is then exhausted. It is being developed with the object of getting approval from the Motor Vehicle Pollution Control Board in California, where exhaust purifiers are likely to be made compulsory in the future. Crankcase emission control devices, which are a rather simpler problem, have been compulsory on new cars in California since April 1 of this year.

Seven American exhaust control devices are now undergoing tests by the Pollution Control Board in California, but these are suitable only for American types of motor car. The Lucas device has already passed two of the three tests laid down by the board, and will be submitted for the final testing when the company's engineers are satisfied that its life expectancy is up to the necessary standard.—*The Motor.*

SMOKE FROM THE BURNING OF INDUSTRIAL WASTES

Middlesex County Council Act

By John S. Hodgins, M.R.S.H., M.A.P.H.I.
(C.P.H.I., Hayes and Harlington U.D.C., Middlesex)

By the time the Clean Air Act 1956 came into force industrial smoke in Hayes and Harlington had been reduced to negligible proportions and compliance with the Dark Smoke (Permitted Periods) Regulations was achieved without any difficulty throughout the District. This was the results of a great deal of hard work during the first half of the decade, during which time the public had become very smoke conscious.

Under these circumstances it was, perhaps, not surprising that the rapid introduction of Smoke Control Areas met with no opposition. Hayes and Harlington's Smoke Control Order No. 1 was, in fact, in the first batch of Orders confirmed by the Minister, and the 10 year programme has, right from the start, run smoothly and without interruption.

In Hayes and Harlington it has always been intended that Smoke Control Areas should really look like Smoke Control Areas: that there should be virtually a complete absence of smoke. For this reason "sticks and paper" are not tolerated and no exemptions have been given to industrial furnaces (many, of course, have exemption as a right under the Exempted Fireplaces Orders).

Having set our sights so high it was, to say the least, annoying to be left with a problem for which there was no legal remedy, i.e. the industrial bonfire.

The particular problems on our hands were:

1. The burning of waste solvents and other highly inflammable liquids by a large internationally-known Company on an open space of approximately 60 acres in extent (completely separate from their factory premises) resulting in voluminous dense black smoke.
2. The burning of obsolete London Transport trolley buses after anything of value had been stripped off, in an isolated gravel pit again resulting in dense black smoke.
3. The burning of miscellaneous waste materials on a refuse tip operated by a firm who undertake the collection of rubbish from factories.
4. The usual factory bonfire of paper, packing materials, rags etc.
5. Burning of electric cable by marine store dealers to remove rubber or textile coverings and also the disposal of worthless articles accumulated in the course of their trade.

These cases could not be dealt with under Section 16 of the Act as no nuisance was caused. Nevertheless, the smoke emitted was extremely objectionable in so far as it could be seen over a wide area and was understandably, a source of irritation to people living in Smoke Control Areas who were under an obligation not to make any smoke at all.

It was little use explaining the niceties of the law on this particular aspect of smoke control to the man in the street: it seemed that an effort to change the law would be a more profitable line of approach.

Accordingly when my Council in 1957 were asked whether there were any matters which they felt should be submitted for inclusion in a proposed Middlesex County Council Bill I suggested that powers be sought to control the burning of industrial refuse. The suggestion was supported by the Middlesex Borough and District Council's Association, was subsequently included in the Bill and ultimately became Section 47 of the Middlesex County Council Act 1961:

> "*Section* 47:
>
> (1) As from the appointed day in any district (other than the boroughs of Heston and Isleworth and Southgate and the urban districts of Friern Barnet and Potters Bar) dark smoke shall not be emitted from any industrial premises in that district and if on any day dark smoke is so emitted the occupier of the premises shall be guilty of an offence and shall be liable to a fine not exceeding one hundred pounds.
>
> (2) This section shall not apply to—
>
> (*a*) dark smoke emitted from a chimney of any building or from a chimney to which Section 1 of the Clean Air Act 1956, applies by virtue of subsection (4) of that section;
>
> (*b*) dark smoke accidentally or inadvertently emitted if all practical steps have been taken to prevent or minimise the emission of such smoke; and
>
> (*c*) premises controlled under the Alkali, etc., Works Regulations, Act, 1906.
>
> (3) In this section—
>
> 'chimney' has the same meaning as in subsection (1) of section 34 of the Clean Air Act 1956;
>
> 'dark smoke' has the same meaning as in subsection (2) of section 34 of the Clean Air Act 1956;
>
> 'industrial premises' means premises used or designed for use for, or held in connection with, the carrying on of any process for, or incidental to, any of the following purposes, namely:
>
> (*a*) the making of any article or part of any article; or
>
> (*b*) the altering, repairing, ornamenting, finishing, cleaning, washing, packing, sorting or canning or adapting for sale or breaking up or demolition of any article; or
>
> (*c*) without prejudice to the foregoing paragraphs, the getting, dressing, or preparation for sale of minerals or the extraction or preparation for sale of oil or brine;
>
> being a process carried on in the course of trade or business; and for the purposes of this definition 'article' means an article of any description including a ship or vessel".

At the Bill stage I was doubtful whether the definition of "industrial premises" was sufficiently wide to cover the first case described above but I was assured by my Council's Clerk and Solicitor that the circumstances of this case were fully covered.

The section was adopted at the earliest possible moment and has proved an unqualified success. All outstanding problems were quickly cleared up and so far no snags have arisen. The wording of the Section seems wide enough to deal with any industrial bonfire likely to occur in Middlesex. If any other Local Authority were thinking of seeking similar powers it might be necessary to adapt the wording to meet circumstances peculiar to their Area.

★ Since this article was written, Mr. Hodgins informs us, his Council has taken proceedings at Uxbridge Magistrates Court (April 25, 1963) under Section 47 of the Middlesex County Council Act against a person who had contravened the Section by burning coils of insulated wire and an old motor vehicle. He pleaded guilty and was fined £5 with 1 guinea costs.

The Stokermatic heating unit which burns the cheapest grades of coal without smoke, costs £1 per week to run and is approved by the Domestic Solid Fuel Appliance Approval Council, is described in a new leaflet available from Draysley Limited, Bentinck Road, West Drayton, Middlesex.

CONTRIBUTIONS TO CLEANER AIR

Industrial and Commercial News

Gas-fired Boiler for Central Heating

A new fully automatic gas-fired boiler, the Vulcan Autostat 33, for whole house heating and hot water supplies is unique in that it requires no chimney. Instead, a neat, balanced flue unit is sealed to the boiler, which enables the appliance to be placed anywhere along an outer wall and facilitates individual kitchen lay-out.

The boiler incorporates push-button electric ignition and an automatic time switch, which can be set to switch the boiler on and off twice daily. It is made of cast iron and the flueways have a glass lining for added protection against corrosion.

Whilst designed for small-bore heating, it is equally suitable for use with existing gravity feed systems. The boiler is housed in an attractive cabinet, available in white, midnight blue, cream and grey and costs £110, including pump and time switch. It has been approved by the Gas Council.

The manufacturers of the Vulcan Autostat 33 are Hattersley Bros. Ltd., of Swinton, Mexborough, Yorkshire.

A "Potterton" Radiator

For the first time, the well-known manufacturers of gas-fired and oil-fired boilers, Thomas Potterton Ltd., has produced its own steel panel radiators. In the past, the question of really accurate figures for surface areas and heat emission rates of radiators has caused some confusion, both to heating engineers who must know exact figures for heat output by a certain type of radiator at a certain price, and to customers who wish to have their requirements specified as accurately as possible.

Pottertons can now offer guaranteed outputs and guaranteed surface areas, based on British Standard 3528:62 for the testing and rating of hot water radiators, so that installers and customers can now calculate the actual surface areas, heat emission rates and prices involved.

The radiators are available in 22 sizes, spread over three different heights and each size is available in double or single panels. Heat emission for the single panel radiators, is 182 Btu/hr. per sq. ft. and 155 Btu/hr. per sq. ft. for double panel, outputs being based on 100 degrees F. differential between mean radiator and ambient temperatures.

Fisher & Ludlow Ltd., of Birmingham are manufacturing the radiators to Potterton's specifications.

Electric Central Heating System

A new and completely-automatic system of central heating which is suitable for smoke control areas has been introduced by B. J. Cambridge (Heetrite) Ltd., of 8 Cork Street, London, W.1. Operating on the principle of circulating warm air through grilles at skirting board level, it is cheaper to install than the cost of building chimneys and flues or of providing radiators and hot water pipes. Further savings are effected by dispensing with the need for storage tanks and space-consuming fuel bunkers or tips.

The Heetrite system is electrically operated and controlled, and each unit is fitted with a replaceable filter to remove dust particles from the atmosphere.

In its simplest form, the installation comprises a combined heating/air circulating unit measuring only 16 in. wide, 13 in. deep and 33 in. high. Installed in a central position in, for example, an orthodox three-bedroom house, it will supply warm air to kitchen, dining room, lounge and hall direct through grilles and with the minimum of ducting.

Alternatively, the installation can be as comprehensive as desired, with grilles in every room, corridor and hall. Warmed air to these grilles is provided through flexible ducting which passes under the floor boards without affecting the decorations or structure of the premises.

New Range of Beeston Boilers

A new range of heating appliances has been introduced by the Beeston Boiler Co. Ltd., Nottingham. These include the new-styled range of solid fuel Sherwood Boilers for full or partial central heating and indirect hot water supply to three to five bedroomed houses. The width of the cabinet is only 1 ft. 5 ins., which makes it suitable for installation in the smallest of kitchens. The boiler is rated from 45,000 to 82,500 Btu/hr., and has been designed to burn solid smokeless fuels.

Another new item are Beeston Matched Boiler Sets, consisting of boiler units supplied by the Beeston Boiler Co. Ltd. and burner and control equipment and combustion chamber materials, which can be ordered from and supplied direct by one of the approved burner manufacturers.

The object of the matched boiler set is to provide an integrated control-heating boiler unit complete with firing and control equipment, retaining at the same time, the advantages of the boiler and burner manufacturers supplying direct to the trade. Joint specifications have been drawn up covering the boiler, burner, combustion chamber and control system to provide the optimum operating performance.

The boiler complies fully with B.S. 779:61 and the rated output is 224,400 to 1,354,000 Btu/hr., based on tests required by this Standard.

To complete the new range of products are the Beeston Steel Panel radiators.

Chimney Grit Collector

A chimney grit collector designed to remove all grit and also a high percentage of dust emitted by small solid fuel boilers, kilns, and incinerators in accordance with the Clean Air regulations, is now manufactured by Davidson & Co. Ltd., Sirocco Engineering Works, Belfast. The collector will also stop unburned carbon smuts from oil-fired boilers and act as an efficient spark arrester.

It is produced in six sizes, from 15 ins. to 30 ins. diameter and is available in two types—high efficiency for chimneys with mechanical draught and low resistance for natural draught installations.

The grit collector, constructed of fabricated steel plate, consists of a short cylindrical inlet section, containing a set of fixed swirl vanes above which the main body of the unit expands upwards in a conical section. This section contains an opening into an external dust pocket at the bottom of which is a tapered outlet. The collector body terminates in a short cylindrical outlet section of the same diameter as the inlet. Both the inlet and the outlet sections are flanged and drilled for bolting directly into the chimney. A drilled flange is also provided on the dust pocket outlet for pipe connection to a hopper.

Grit laden gases entering the collector pass through the fixed vanes which create a swirling motion to throw the grit outwards by centrifugal force against the slightly sloping wall of the upper section. Here, it is trapped and led into the dust pocket, from which it falls to the hopper positioned near ground level.

In the removal of grit (particles over 76 microns), the high efficiency collector has an efficiency of 92 per cent and the low resistance type an efficiency of 87 per cent. The collectors will also remove a high proportion of the finer dust, giving overall efficiencies of up to 81 per cent (H.E.) and up to 72 per cent (L.R.) on solids for a coarse stoker-fired dust.

The unit is simple to install and this can be carried out with little disturbance of normal working arrangements. The collector can be fitted at the top or base or at any intermediate position on existing steel chimneys. On brick stacks, it can be fitted either at the top or in a "by-pass" ducting arrangement at the base. In the latter case, a system of dampers can be used and this has the advantage of enabling the unit to be isolated for periodic inspection.

The collector has been designed as simply as possible and there are no moving parts. Once installed, it needs very little maintenance. Parts which may, over a long period, be affected by wear or corrosion can be easily repaired or replaced.

The Sirocco chimney grit collector is standardized up to 30 in. diameter. For chimneys of greater diameter, the Davidson Scroll type S.P. collector is available. In cases where natural draught has to be supplemented to allow the high efficiency type grit collector to be installed, a Sirocco bifurcated axial flow fan can be supplied, combined in a single unit with the collector.

Wet Gas Scrubber

Recently patented is a new wet gas scrubber known as the Tailor "CVX". This is a vertical machine with a narrow waist resembling two cyclone collectors superimposed one on the other. The gases enter the scrubber tangentially through a scroll attached to the lower half. The bottom half of the scrubber is internally fitted with a vertically disposed concentric screen, fabricated as a rolled plate and perforated with circular holes. This screen is continuously flushed on both sides with water, or other solvent, withdrawn from the bottom cone and re-circulated through two sprays. One is located near the top of the screen and the other at the top of the scrubber.

If hot, however, the gases first pass through a spray header in the inlet duct, where they are cooled and wetted before going to the scrubber proper. As the wet gases are forced into the scrubber tangentially, they are forced through the screen perforations where they are washed by the liquor coursing over both sides of the screen. The wetted solids are washed down into the bottom cone from which they are withdrawn and pumped through a small wet cyclone. At this point, the coarser solids are drawn off and sent to a thickener for the removal of excess water, the remainder of the liquor being recirculated to the sprays.

The energy of the gases, as they pass through the screen, is used to atomize some of the liquor which, continuing to spin assists diffusion and gas partition, finally being forced upwards through the narrow waist, still with a spinning motion. The mechanically entrained water and solids are thus separated from the now cleaned gases which are then sent to a heat recuperator, or to atmosphere.

The suspension of solids, 5 to 10 per cent solids, which are withdrawn from the scrubber system and sent to the thickener, are allowed to settle to a concentration of about 50 per cent solids, the water being sent to waste if carrying alkalies or acids in solution. The concentrated solids are likewise sent to waste, or reclaimed.

The following details relating to a cement kiln chimney duct are the results of tests carried out recently by independent dust collection engineers:

Initial Dust Load (Cement Kiln Dust) 12 grains/cu. ft. 60 per cent was —5 microns. Gas temperature was 550°F.

Highest: 99·7 per cent with scrubber unit pressure drop of 2·5 ins. W.G.

Lowest: 96·2 per cent with scrubber unit pressure drop of 0·5 in. W.G.

Average of 5 runs: 98·4 per cent with pressure drop varied between 0·5 and 2·5 ins. W.G.

The "CVX" scrubber is claimed to have the widest high-efficiency range of any known wet scrubber due to the capability of changing the effective nozzle area by simply changing the scrubber liquor level in the cone. Its design maintains an "eddy current free" condition which eliminates the dead spots that lead to fouling in so-called turbulent scrubbers.

The "CVX" is capable of absorbing high dust loadings—even approaching 100 grains/cu. ft.—with the lowest water consumption of any known wet scrubber, due to the recycling and concentration features. The "CVX" principle requires less pressure drop (*i.e.* horse power) for a specific scrubbing efficiency.

Standard equipment is available covering a range from 2,000 cfm. to 150,000 cfm.

RECENT TRADE LITERATURE

Standard Gas-Fired Furnaces—descriptive leaflet No. V26B (Incandescent Ltd.)

Heavy Fan Engineering—No. 25 (5th edition). This is a 24-page booklet providing a pictorial survey of the large and heavy types of centrifugal, axial and "paddle type" fans, single and multistage blowers and exhausters manufactured by Keith Blackman Ltd. A special section is devoted to clean air equipment, such as induced draught and grit arresting fans and dust and fume extraction plant. (Keith Blackman Ltd.)

Blowers and Exhausters—No. 47 (2nd edition). A 52-page booklet, covering the "Tornado" range of backward bladed, types 8, 9, 13 and 14, steelplate blowers and exhausters and including 25 pages of capacity tables and 12 pages of dimension drawings. This is a comprehensive catalogue for all who are concerned with forced draught, cupola and furnace blowing, forge blowing, supercharging, gas boosting, fume removal and cooling equipment. (Keith Blackman Ltd.)

Centrifugal Fans (BCB 152A Type)—Publication No. 537/62—40-page catalogue giving all the necessary data to enable the selection of the most suitable type of centrifugal fan for any particular purpose. (Davidson & Co. Ltd.)

Air Conditioning Units—Publication No. 523/62—brochure on spray type and dry type air conditioning units. (Davidson & Co. Ltd.)

Chimney Grit Collector—Publication No. 518/63. Brochure on high efficiency and low efficiency collectors. (Davidson & Co. Ltd.)

Chem-Jet Systems—Bulletin CJDS-1. A brochure on dust control through preventive techniques. (Dust Suppression Ltd.)

The Hydro-Volute Scrubber—Brochure describing the exclusive Volute design which produces new efficiency in dust collection. (Dust Suppression Ltd.)

AIR POLLUTION ABSTRACTS

662. Crankcase Emission Control Devices for Typical Gasoline Engines. Informative Report No. 1. TA-10 Vehicular Exhaust Committee. (Jour. Air Poll. Contr. Ass., April, 1963, **13**, 173–4). Although the control of blowby is not the complete answer to motor created air pollution, it is an important step and one that is desirable and necessary in many communities. A significant part of the total hydrocarbons can be controlled by these devices which are now available. Each of the crankcase devices described in the report is capable of controlling blowby emissions to a high degree. The selection of the "best" control system or systems involves a complex judgment involving cost, control efficiency, maintenance requirement, and a number of side effects on engine operation. No such judgment is made by the Committee at this time.

The decision by the Automobile Manufacturers Association to install crankcase controls on all American cars can be expected to lend impetus to the development of control systems. The Committee therefore recommends that communities which have a need for crankcase controls on used cars, do not institute a mandatory crankcase control programme on these vehicles, but suspend judgment for a period of one year to allow for additional experience. It is proposed that the Committee again report before the 1963 APCA meeting with further recommendations.

663. Estimation of Exhaust Gases from Motor Cars in Street Air (In German). Baeulmer, J. and Mueller, R. (Z. Praeventivmed., Jan./Feb., 1961, (1), 10–23; Fuel Abs., Aug., 1961, vol. **2**, (8), 128). After reviewing the important toxic cases from motor cars, the methods used in examining the air in street and garages at Basle are described and the results reported. Carbon monoxide, determined with the recording "Draeger-CO-apparatus" was found in streets with great traffic in a quantity up to 0·003 vol. per cent. The concentrations in a subterranean garage were sometimes higher than 0·01 vol. per cent. A transportable apparatus for the sampling of exhaust-gases from motor-cars (formaldehyde, nitrogen oxides, ammonia, sulphur dioxide) is described and some results of the air pollution in the streets of Basle are given.

664. Lime for removing sulphur dioxide from gases. Pinaev, V. A. (Vestn. tekh. ekon. Inform. nauch.-issled. Inst. tekh.-ekon. Issled. Gos. Kom. sov. Min. SSSR po Khim., 1961, (11), 46–48; Ref. Zh., Khim., 1962, 141397). A procedure is given for removing SO_2 from exhaust gases by using lime; the chief advantages of this method are: the possibility of purifying hot and dust-laden gases without first cooling and removing the dust; use of a cheap raw material; low capital investment; possibility of automation. A disadvantage of the procedure is the relatively high hydraulic resistance of the scrubber.

665. Atmospheric Pollution: its measurement and some effects on paint. Holbrow, G. L. (Paint Research Station, O.C.C.A.J., Oct. 1962, **45**, 710–8). Describes various standard methods for the measurement of atmospheric pollution. Records of atmospheric sulphur dioxide and rainwater analysis collected from two paint exposure sites (suburban and industrial) indicate the nature and concentration of pollution likely to affect paint films. Paints containing zinc and lead pigments are among those considered. Specific effects of pollution on paint films are the attack on young films by sulphur dioxide, causing a delay in drying (the drying of paints containing basic pigments such as white lead or zinc oxide was not greatly affected), production of water sensitivity and possible attack on pigments; formation of crystalline bloom; and staining.

666. Comparison of Pulmonary Function and other Parameters in two Communities with widely different air pollution levels. Prindle, R. A. *et al.* (American Jour. of Public Health, February, 1963, **53**, 200–218). A study was made among persons 30 years of age and over in two small neighbouring communities characterized by marked differences in levels of air pollution. Methods and findings on air sampling, pulmonary function, and a number of other items are reported and discussed. It is concluded that the techniques employed in this study may prove helpful in further defining the public health problem of pneumoconiosis, emphysema, and bronchitis in relation to air pollution.

667. The toxic effects of low concentrations of NO_2 in the air. Lykova, A. S. (Trud. leningr. sanit.-gig. med Inst., 1958 (1960), 117–125). The toxic effects of NO_2 were studied in summer and winter using male rabbits. Long-range effects of low concentrations (3 and 7 mg/cu. m.) of NO_2 exposure are retardation of growth, decrease of hemoglobin, short-time increase of erythrocyte and reticulocyte counts, and leukocytosis. Effects upon the sugar content of blood was not significant.

668. Carcinogenicity of Air Pollutants. Sakaguchi, T. (Acta med., Japan, 1959, **29**, 3777–3808). Soot (280 g.) from a chimney of a coal furnace was extracted in 1:1 benzene or acetone, as was waste gas from a motor cycle in 500 ml. xylol or benzene. The extracts were applied 6 days a week to the back skin of C3H mice. Tumour was not observed at the applied spot, but mammary cancer was found.

669. The Sampling and Filtration of Airborne Particles. Dorman, R. G. (Pap. to Symposium on Dust Control and Air Cleaning at Instn. Mech. Engrs., April 4, 1963; Chart. mech. Engr. Mar., 1963, **10,** (3), 146). Theories of filtration are reviewed in, general terms, with special reference to fibrous filters. The basic factors influencing choice of equipment for filtration of different types and sizes of particles are discussed and methods suitable for measuring efficiencies of large air cleaning units are described in some detail.

670. Air Pollution and Chronic Respiratory Disease. Rowak, S. N. and Massey, F. (Amer. Rev. respir. Diseases, Nov., 1962, **86,** 703; Industr. Hyg. Dig., Jan., 1963, **27,** (1), 27). An investigation was made of the day-to-day variation in respiratory function in selected patients with chronic obstructive airway disease. The changes in respiratory function were compared with various indices of air pollution, most notably particulate matter, sulphur dioxide, and nitrates. Although there was a correlation between air pollution in general and deterioration of pulmonary function, no specific pollutant could be incriminated. Marked changes, in both lung volumes and airway resistance, occurred in these subjects within as short a time as 24 hours.

671. Short-term Air Pollution Studies. Bell, F. A. (Civil Engineering, U.S.A., February, 1963). The author discusses both the usefulness and applicability of this type of study and also its limitations. The data collected in short-term studies in Washington, D.C.; Phoenix, Arizona; Tucson, Arizona; Fresno, California; and Lynchburg, Virginia, are presented. Conclusions drawn from the above short-term studies are included.

672. Variation in Respiratory Function in Selected Patients and its relation to Air Pollution. Spicer, W. S. (Amer. Rev. respir. Diseases, Nov., 1962, **86,** 705; Industr. Hyg. Dig., Jan., 1963, **27,** (1) 27). Pulmonary function measurements taken 4 times weekly in a group of severely involved chronic respiratory (non-tuberculous patients and in normal individuals were correlated with simultaneously monitored air pollutant levels, temperature, and humidity (at the hospital) serially over 18 months. Variability of test performance was greater among patients than among normal persons. There was poor correlation of such variations with environmental changes for the individuals or for the groups. In the few instances (6 of 31 patients) in which correlation coefficients were "interesting", prior exposure to ambient carbon monoxide seemed to be possibly involved in four cases.

673. Improvements in and relating to Smokemeters. Leslie Hartridge Ltd. (B.P. 918, 525/1963). In smokemeters depending on illumination of photocells through an air sample, annular rings with sharp inner edges have been introduced to prevent reflection from water films on the tube walls, and to prevent deposits of soot reducing the amount of light.

674. Correlation of Methods of Diesel Smoke Measurement. Lyn, W. T. (CAV Engng. Rev., Dec., 1962, **2,** (1), 27; Thornton Res. Cent. Engng. Abs., 1 Feb., 1963, **7**). Correlation charts and graphs are given relating three scales of measurement to each other and to an absolute scale in mg./cu. ft. The smoke level limit recommended by Bosch is given in terms of Hartridge units.

675. The Influence of Atmospheric Contaminants on the Corrosion of Steel. Greenblatt, J. H. and Pearlman, R. (Chem. Can., Nov., 1962, **14,** 21–23; APCA, Jan., 1963, **8,** (8), 2). Field tests over two years and laboratory studies showed that the controlling factor in corrosion was SO_2 pollution.

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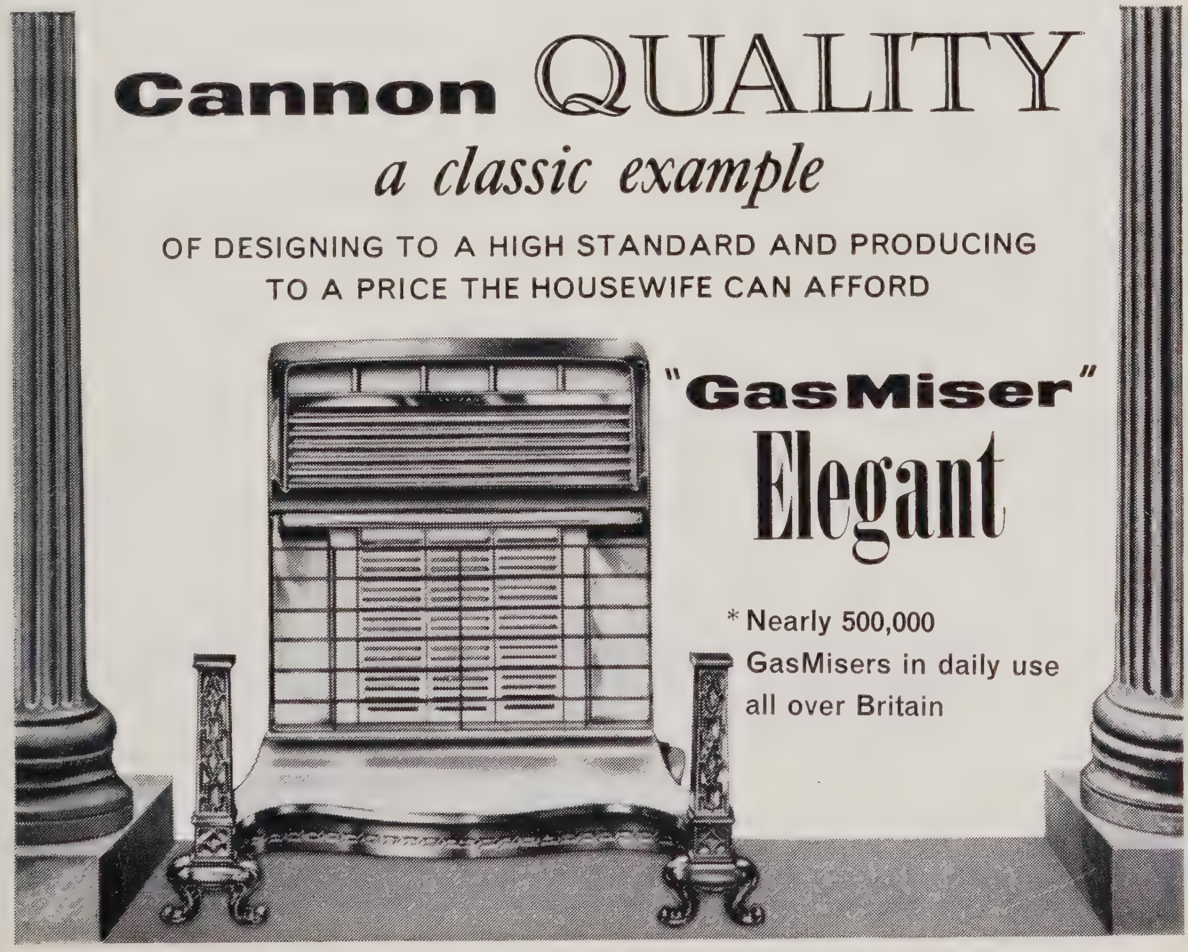

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676. Air Pollution. Merriman, A.D. (Edg. Allen News, Feb., 1963, **42** (488), 29–31). A general review of pollutants (from fuels) their measurement and studies of their effects, and of methods of washing soluble gases from flue gases, in particular the water curtain or bell first suggested by Boussinesq in 1869.

677. Air Pollution from Diesel Exhaust. Battigelli, M.C. (J. occup. Med., Jan., 1963, **5**, 54–57). It appears that the information available in the literature points to a relative harmlessness of diesel exhaust. Both clinical and experimental observations indicate that within the range of commonly encountered levels of pollution from diesel exhaust, no health damage may be consistently obtained in animals or defined clearly in humans. Additional and more systematic observations are in order.

678. The significance of clean air in protecting vegetation. (In German). Ullrich, H. (Staub, March, 1963, **23**, 147–151). In addition to the large specific external surface, the higher green plants also have generally an even larger internal surface than the boundary of their intercellular system. These surfaces are connected by slot-like apertures on stem and stalk organs through lenticels. Both serve the normal gas exchange but also make possible the ingress of gaseous air pollution into the plant organs giving rise to plant damage. These are extremely varied and are governed by considerable differences in specific types and strains of the plants, also by differences in locality and, in the case of useful plants, by different care and feeding. This makes it difficult to ascertain limiting values for the air pollution which is still permissible.

679. Emission effects on animals. (In German). Rosenberger, G. (Staub, March, 1963, **23**, 151–155). Although animals are exposed to industrial emissions just like the humans, there are considerable differences in the effects. Gas and dust emission scarcely cause direct disturbance to the health of animals, but rather act indirectly causing damage through meadow feed, other plants or hay. General phenomena of illness exist in retarded development, lack of appetite, digestive disturbances, reduction of milk yield, thinness, weak offspring, sterility, etc. The most important illnesses in animals resulting from lead, zinc, arsenic, copper, molybdenum and fluorine are discussed and proposals are made for reducing the losses and controlling damage.

680. Maximum size of condensing power stations in polluted air conditions. (In Russian). Zhilin, B.G. (Pwr. Sta., Moscow, Nov., 1962, vol. **33**, (11), 20–27; C.E.G.B. Dig., Mar. 16, 1963, **15**, (6), 14). After a brief discussion of the factors which affect the degree of atmospheric pollution in the vicinity of power stations, the author lists the formulae used in calculating the concentrations of the various chemical constituents of the atmosphere and the ratios of fuel consumption to power output. A more detailed treatment is given of factors such as the number of chimneys in a power station, the exit velocity of the gases from the chimneys and the height of the chimneys.

Appointments

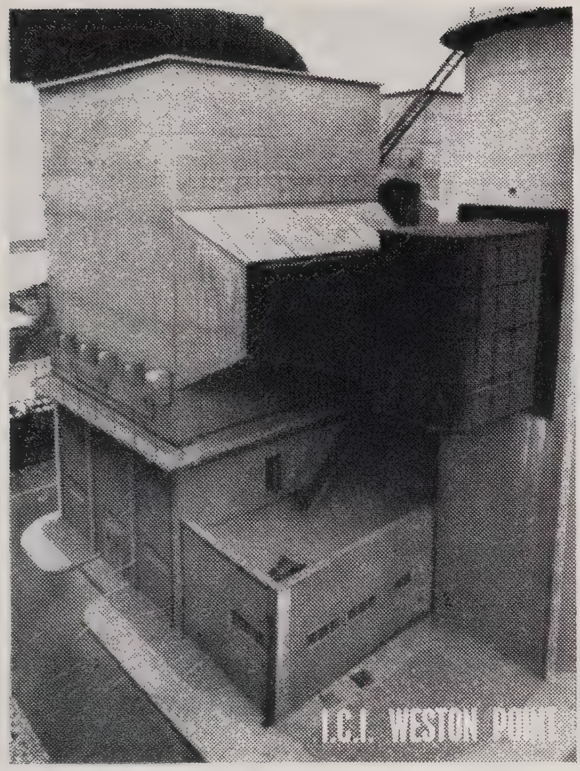
The National Coal Board have appointed Mr. John Menheneott to be Assistant Director-General of Marketing. The Gas Council has appointed Dr. W. A. Simmonds to be Director of Industrial Research, a new appointment which the Council has made in view of the increasing importance and complexity of industrial applications of gas.

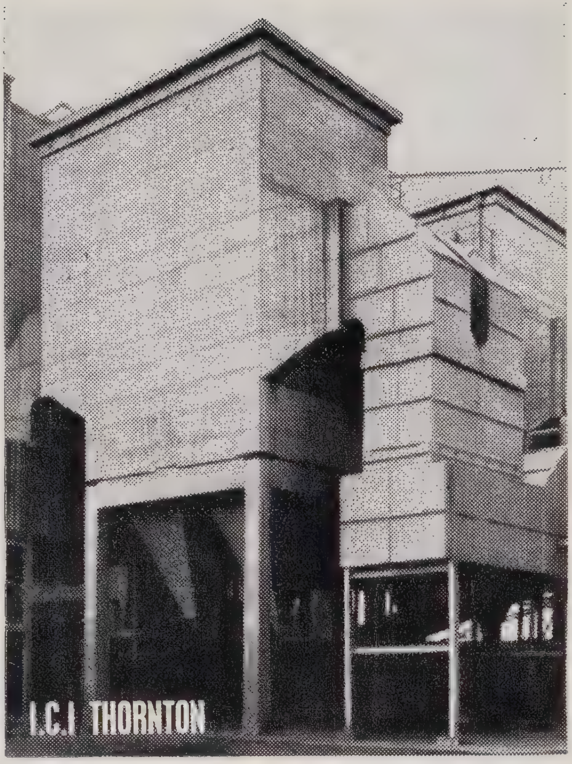
Hospital Installs Smokeless Incinerator

The Croydon General Hospital, Surrey, is situated in a Smoke Control Area and, in order to comply with the regulations, the Regional Hospital Board has agreed to install a new incinerator to replace the existing solid fuel one to overcome the difficulties of smokeless combustion of waste products.

The Board decided on a "Zone" No. 2 type smokeless incinerator, which has a capacity of destroying one ton of waste every eight hours. It is gas-fired for its primary furnace and also for the after burners, fitted as a safeguard to overcome and eliminate any smoke or unburnt refuse scraps which may inadvertently be carried into the atmosphere during the burning operation.

The new incinerator is installed on the site of the old one and adjacent to the disused solid fuel boiler chimney. The incinerator flue has been ducted into the chimney to give the best possible dispersion of the hot exhaust gases. A fly ash arrester prevents the light ash from burnt paper, etc. escaping with the gases.





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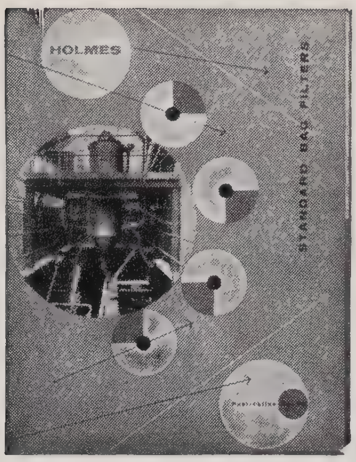

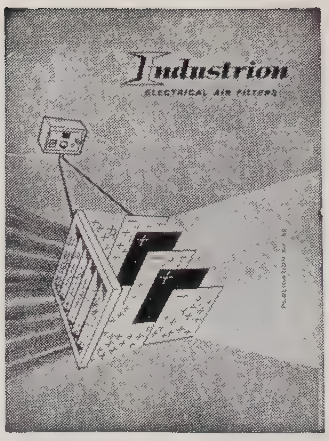

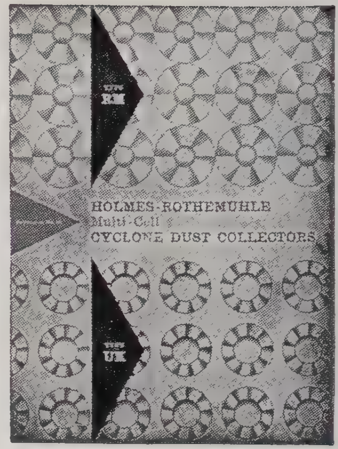

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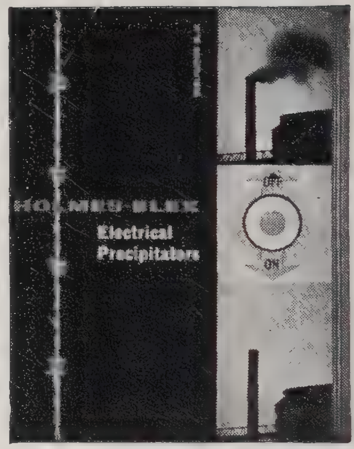

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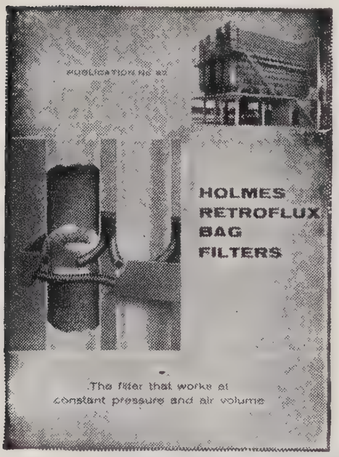

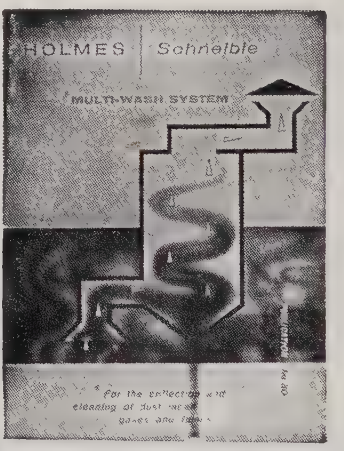

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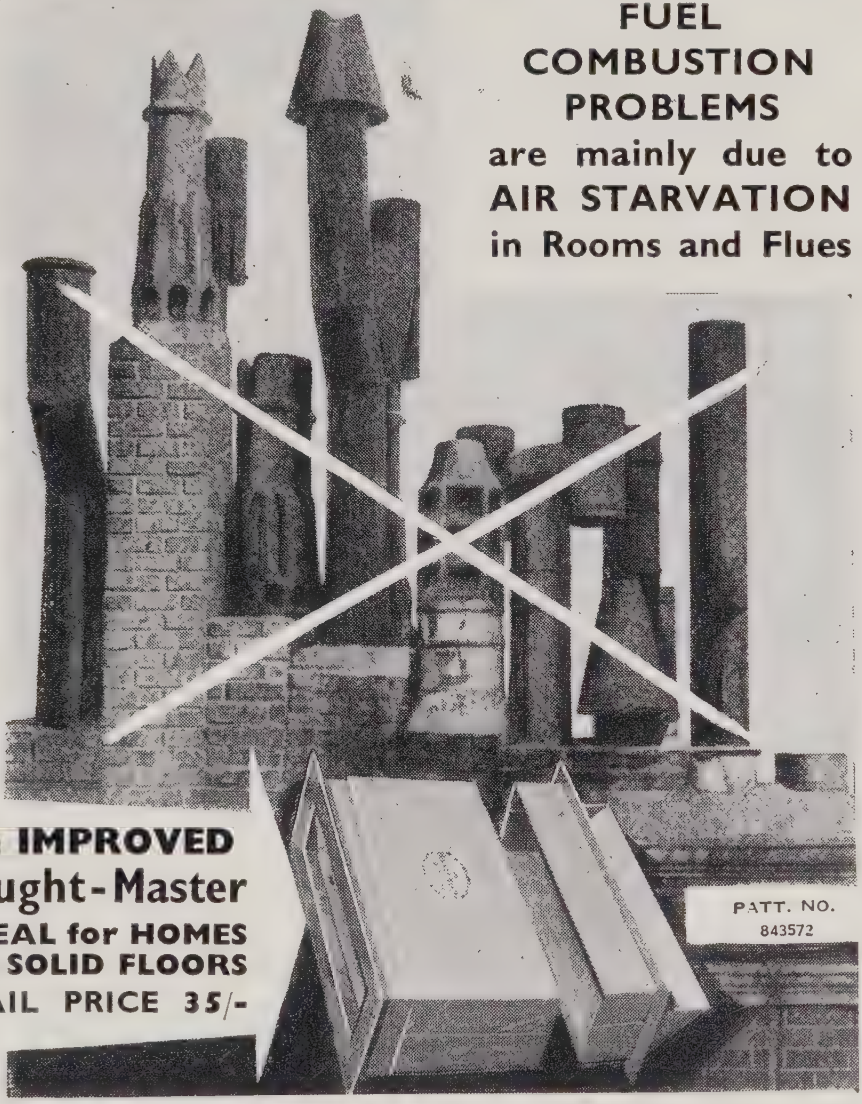

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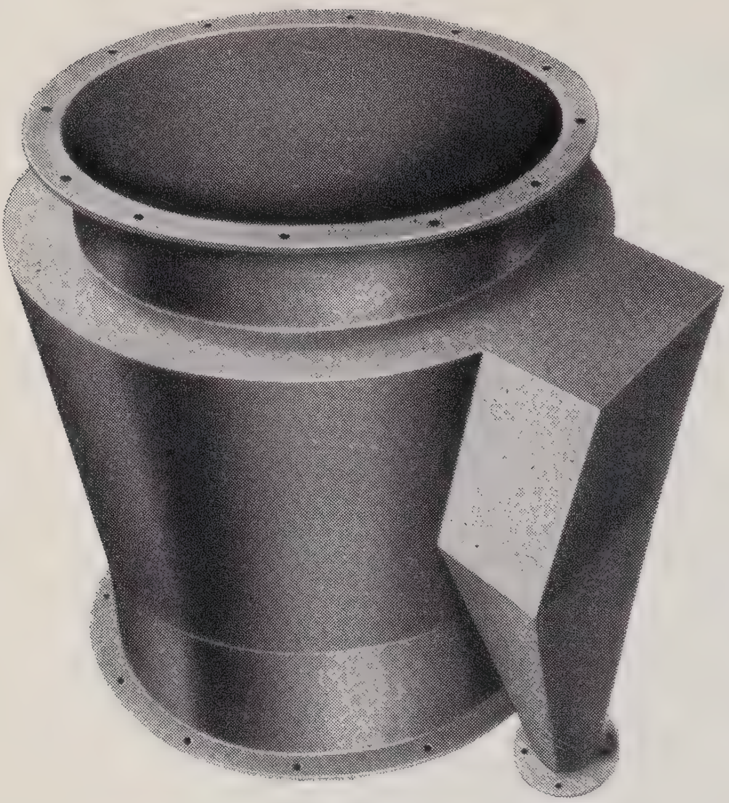

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SIROCCO CHIMNEY GRIT COLLECTOR

Designed to combine optimum efficiency with low cost and minimum maintenance the Sirocco Chimney Grit Collector provides an ideal means of eliminating grit and removing a high percentage of dust emitted by small solid fuel-fired boilers, kilns and incinerators, in accordance with the statutory Clean Air Regulations. It can, in addition, be employed effectively to arrest unburned carbon smuts from oil-fired boilers, and will also serve as an efficient spark arrester.

EFFICIENCY

The "Sirocco" Chimney Grit Collector is produced in six sizes, ranging from 15″ to 30″ diameter. Two types are available: High Efficiency (H.E.) for chimneys where mechanical draught is employed, and Low Resistance (L.R.) for natural draught installations. In the removal of grit (particles over 76 microns) the H.E. Collector has an efficiency of 92 % and the L.R. type an efficiency of 87 %. The Collectors will also remove a high proportion of the finer dust, giving overall efficiencies of up to 81 % (H.E.) and up to 72 % L.R. on solids for a coarse stoker fired dust.

RELIABILITY

The greatest possible simplicity consistent with high performance has been achieved in the design of the unit. There are no moving parts and once installed this robustly constructed Collector will perform its duties over a long period.

COMBINED FAN AND GRIT COLLECTOR UNIT

In cases where it is desired to supplement natural draught to permit the installation of the high efficiency type Grit Collector, a Sirocco bifurcated axial flow fan can be supplied with the Collector, the two being combined in a single unit.

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The Iron Fireman coal-burning Automatic Stoker will solve the problem of Smoke without the use of expensive fuels. The recognised method of burning bituminous coal is to use under-feed stokers, which are now an exempted class of appliance under a recent order made by the Ministry. Iron Fireman Stokers are thus being installed in many Smoke control areas throughout the country.

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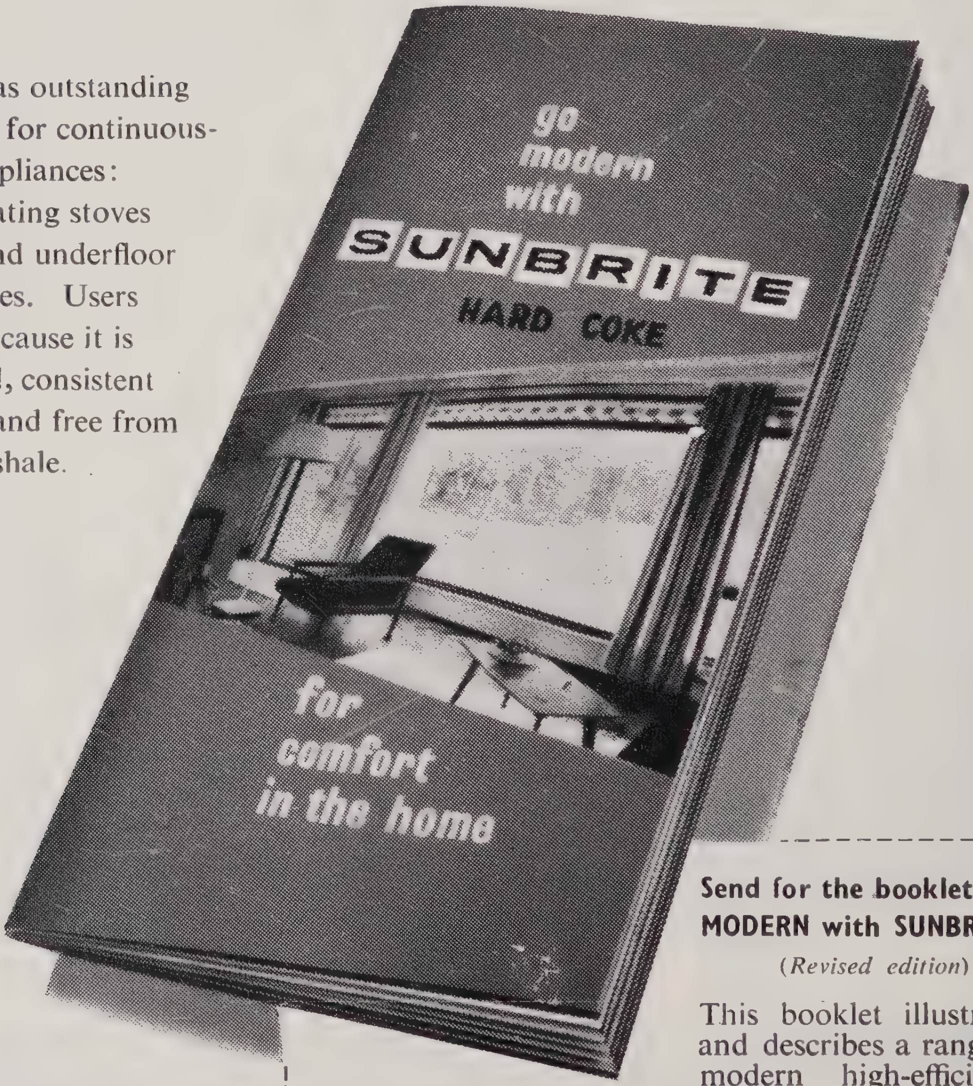

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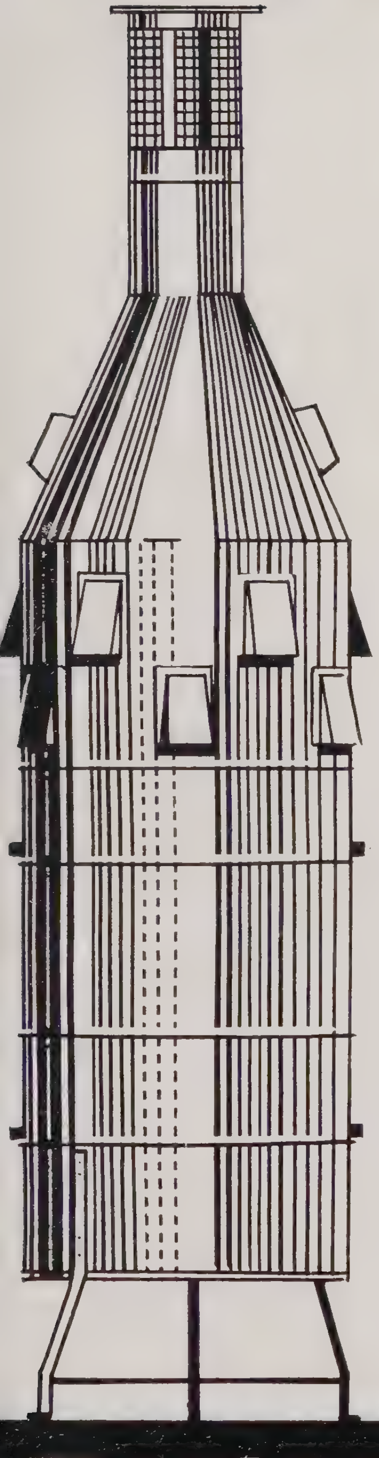

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Electric water heaters, and cookers too, are clean and hygienic. Walls and paintwork stay like new.

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The recent Parker-Morris report on 'Homes for today and tomorrow' recommends that the number of socket outlets installed should be sufficient to supply all the electrical appliances that are likely to be used.

. . . go electric

Ask your Electricity Board for the free leaflet 'The Clean Air Act and You' or write to the Electrical Development Association (NT/P), 2 Savoy Hill, London, W.C.2.

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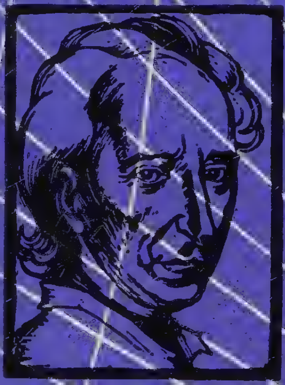
SMOKELESS AIR

JOURNAL OF THE
NATIONAL SOCIETY FOR CLEAN AIR



No. 127 ⋆ AUTUMN 1963 ⋆ 2s. 6d.

In this Issue

The Smoke Control Situation ★ Chimney Heights ★ Mobile Laboratory for Fuel Oil Investigations ★ Why not Carless Zones? ★ Steel Foundry Melting Furnaces ★ The Sulphur Problem

WHO'S SMOKING?

EAGLE-EYED, ACTIVE INSPECTORS WILL SOON WANT TO KNOW. SEE IT'S NOT YOU! NOT *YOUR* CHIMNEYS! GET A SMOKELESS ZONE!

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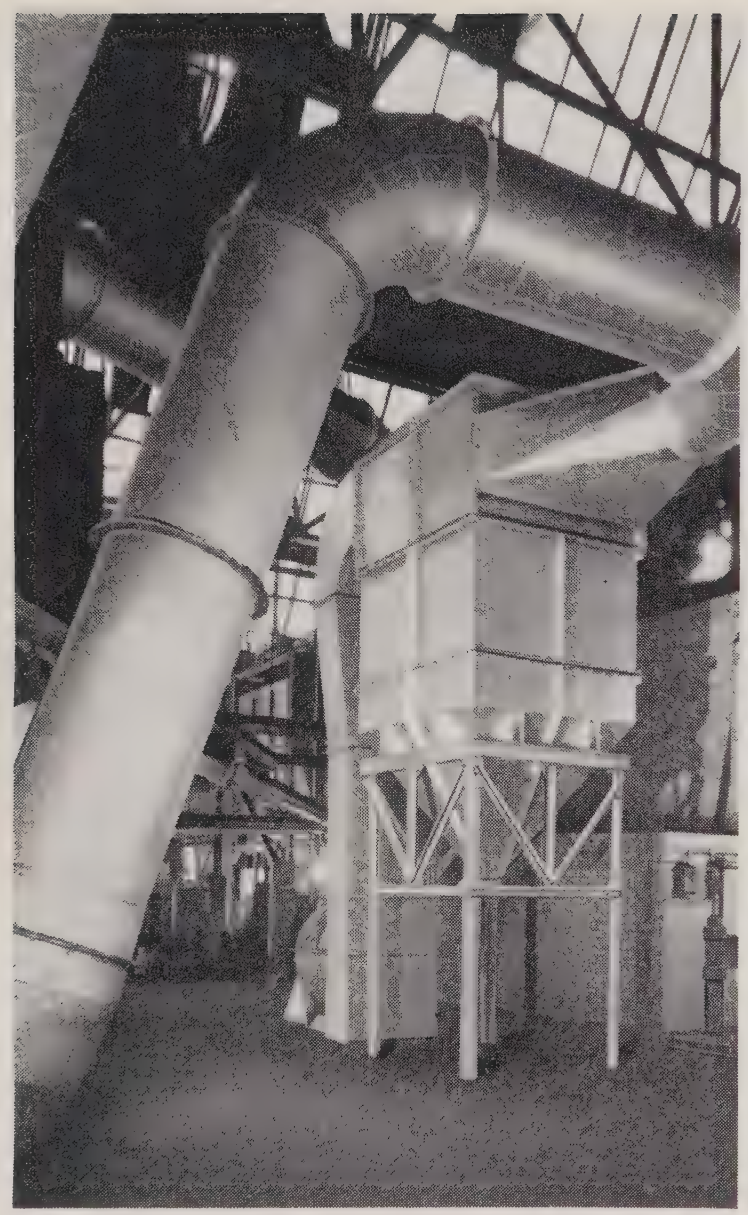

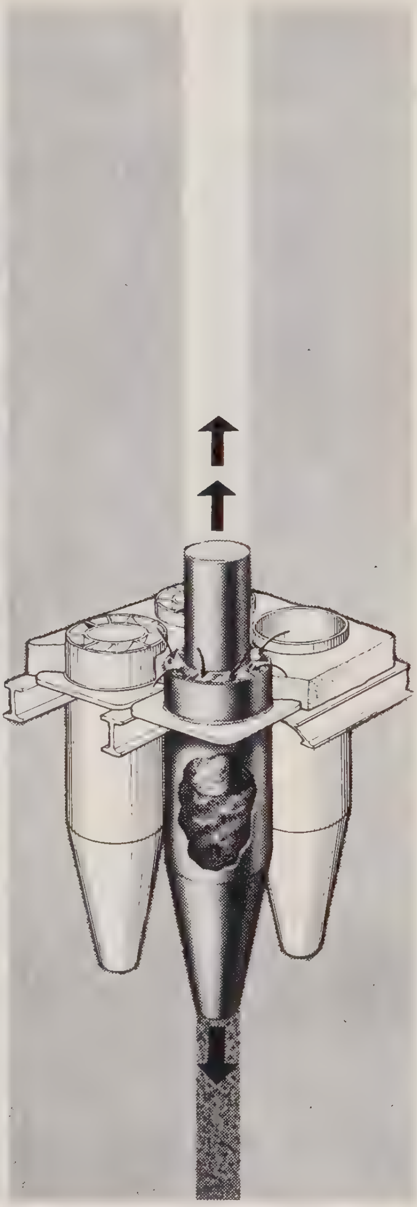

Holmes-Rothemuhle Multi-Cell Cyclone Dust Collectors

The photograph shows the Holmes-Rothemuhle Multi-Cell Cyclone Dust Collector installed at the Derby Works of Ley's Malleable Castings Co. Ltd. This unit, which cleans gases from a P.F. fired melting furnace after they have passed through a waste heat boiler, has operated at a constant efficiency of over 80% since it was installed almost three years ago. A second installation was completed almost two years ago and a third is under construction.

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clean air

The Great Smog of London last December killed 340 people ; in 1956 and 1957 over 750 died. The highest total of smog deaths was in 1952 when in London alone nearly 4000 lost their lives through air pollution. The *Clean Air Act* of 1956 was indeed necessary and timely.

This Act imposes upon all users of industrial furnaces responsibilities for ensuring satisfactory combustion and the control of dust emission. The former can now be readily attained, but *continued efficiency of dust control* is a more difficult matter, involving legal responsibilities bound up with the maintenance of efficiency over the years.

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WHY
WHERE
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HOW

CLEAN AIR...

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Oil is an approved fuel that very many people are choosing for its economy and capability as well as for its clean burning. Giving full advice and practical assistance is an important part of our service to prospective users. Over the past few years, our Industrial Fuels Superintendents have extended that service by helping many Local Authorities resolve Clean Air problems. Perhaps this would be useful to you, too.

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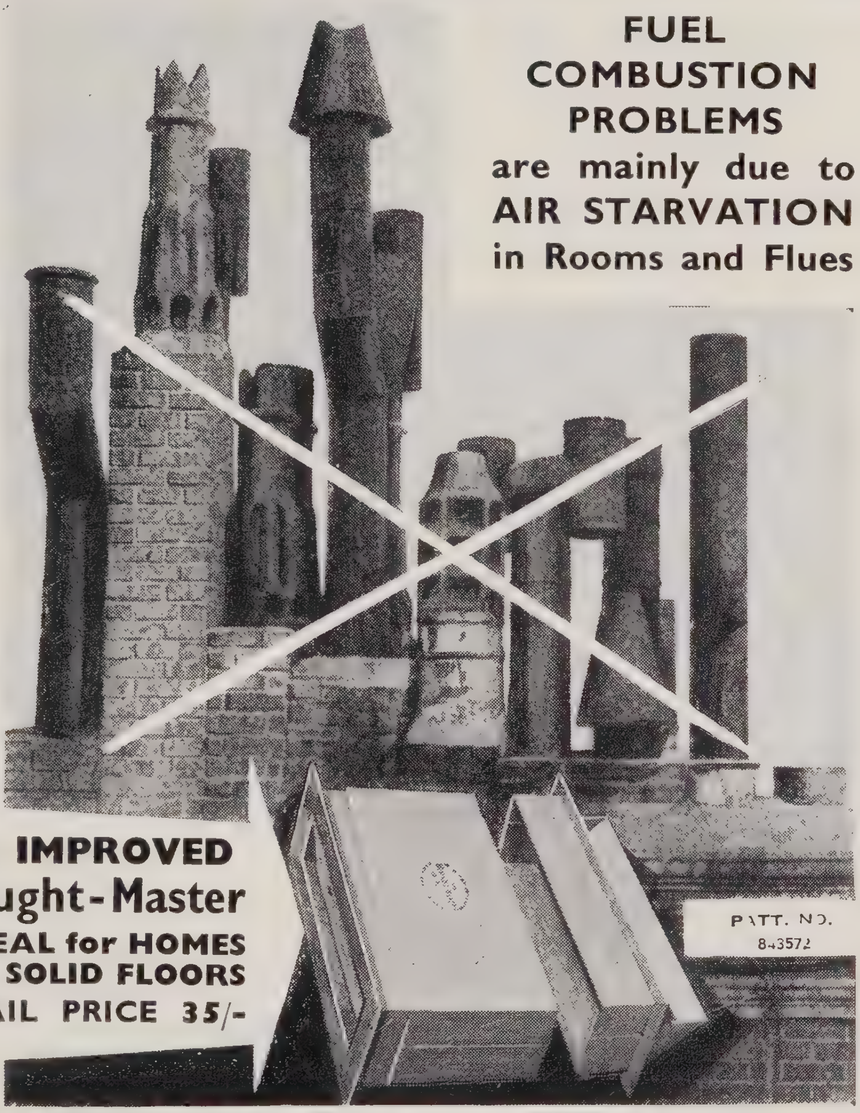
FUEL COMBUSTION PROBLEMS
are mainly due to
AIR STARVATION
in Rooms and Flues



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ECCLES, MANCHESTER. APRIL, '62

"*. . . I must say this (the DRAUGHT-MASTER) is all you CLAIM. My house has never, ever been so smoke and dirt free, and I have lived in it for 25 years . . .*"

The importance of acceptable ventilation cannot be overstressed

Patentees and Manufacturers:

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The Council and their Architect...

. . . Were walking close at hand;
They wept like anything to see
Such tracts of council land:
'If only we could build some homes
To do our council grand.

'If seven homes on seven plots
Were built in half a year,
Do you suppose,' the Council said,
'We'd make our tenants cheer?'
'I doubt it,' said the Architect,
'Unless a Parkray's there.'

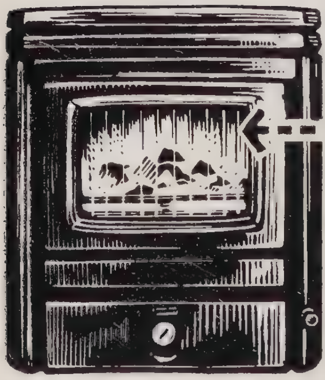
'The time has come,' the Council said,
'To talk of many things:
Of homes with warmth and central heat
(In fact what Parkray brings)
And where the water's boiling hot
Where heating has no strings.'

'An open fire,' the Council said,
'Is what we chiefly need;
Rads, towel rail, hot water too
Are very good indeed,
And as the Parkray's all enclosed,
Control is guaranteed!'

'The 77's what we want,'
The Architect did beseech,
'The cosy fire burns smokeless fuel,
The cost's within our reach,
Heats rads as well in other rooms,
It really is a peach.'

'If we could build with careful thought,
Homes that have all you've said,
Do you suppose,' the council mused,
'We'd end up in the red?'
'I doubt it,' said the architect,
With Parkray in his head.

Parkray



### open fire behind glass

PARKRAY 77
It looks and feels like an open fire yet it has the greater efficiency of a totally enclosed appliance. It will effectively heat a room of up to 1800 cu. ft, plus 50 sq. ft. of radiating surface, plus all the hot water. Without hot water up to 80 sq. ft. of radiating surface.

PARKRAY 66
This smaller boiler version of the Parkray 77 heats all the hot water and a towel rail—*or* two radiators.

PARKRAY 16
Open fire high output boiler flue set which can be used to run a five radiator system or 2/3 radiators plus hot water and a towel rail.

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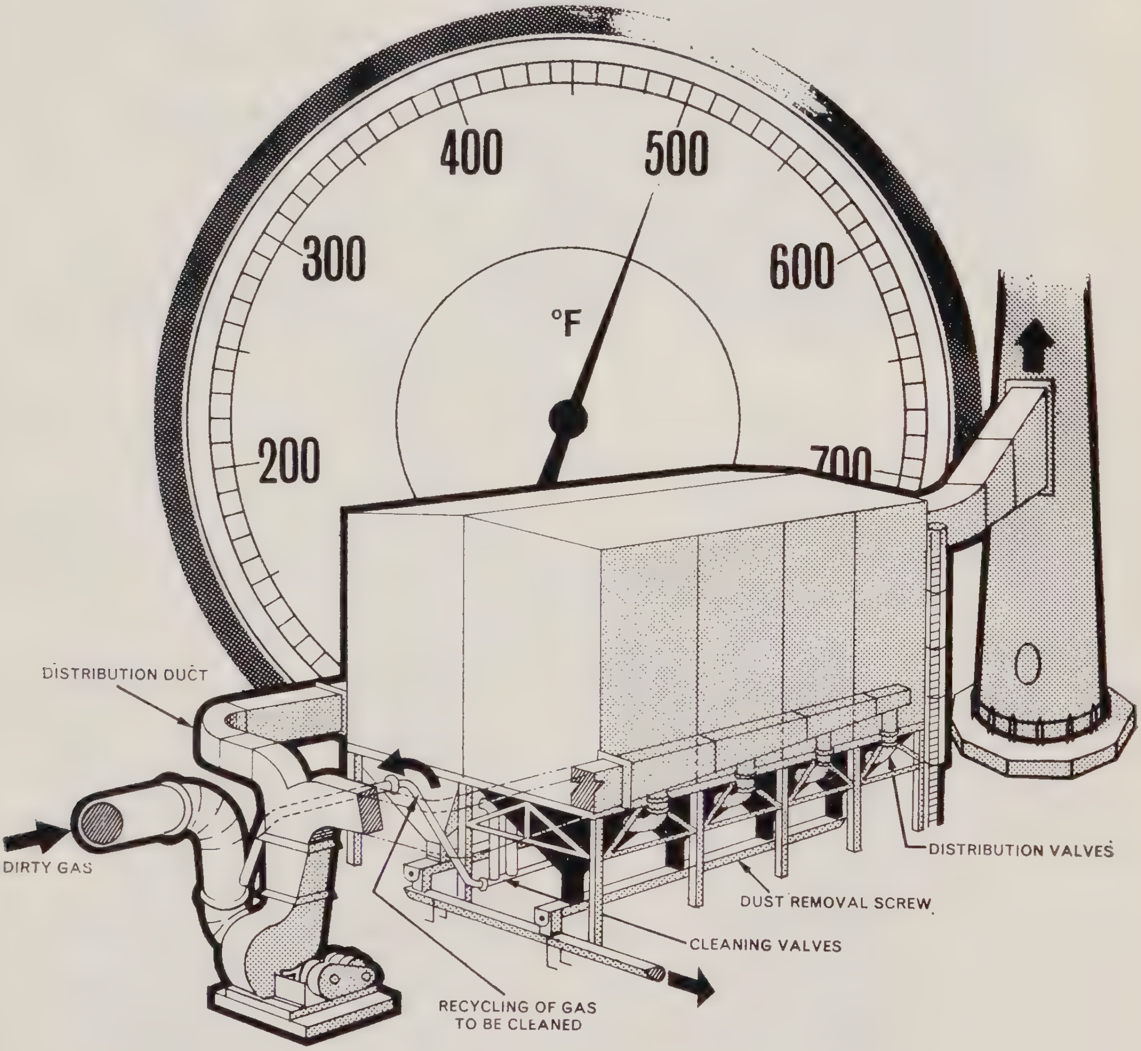
LODGE-COTTRELL DUST FILTERS CAN COPE AT 500°F

thanks to glass fibre sleeves with advanced filtering techniques



The glass fibre sleeves of the new Lodge-Cottrell fabric pocket dust filter enable it to cope with gases at temperatures of up to 500°F. The product of many years' research, this new filter is suitable for almost any dust or fume-producing process. It can be supplied in single or multiple-unit form and extra units can be added later if required. Designed and built to combine high efficiency with automatic trouble-free heavy-duty operation, it can be the economical solution to *your* high temperature gas cleaning and dust collection problems. Lodge-Cottrell also offer fabric pocket dust filters for operation up to 130°C.

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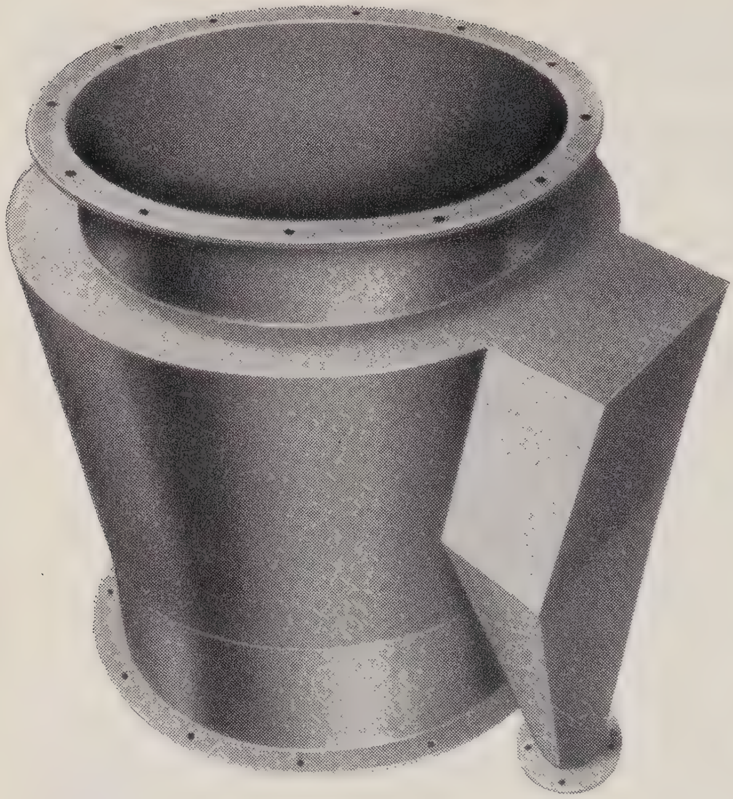

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RELIABILITY

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COMBINED FAN AND GRIT COLLECTOR UNIT

In cases where it is desired to supplement natural draught to permit the installation of the high efficiency type Grit Collector, a Sirocco bifurcated axial flow fan can be supplied with the Collector, the two being combined in a single unit.

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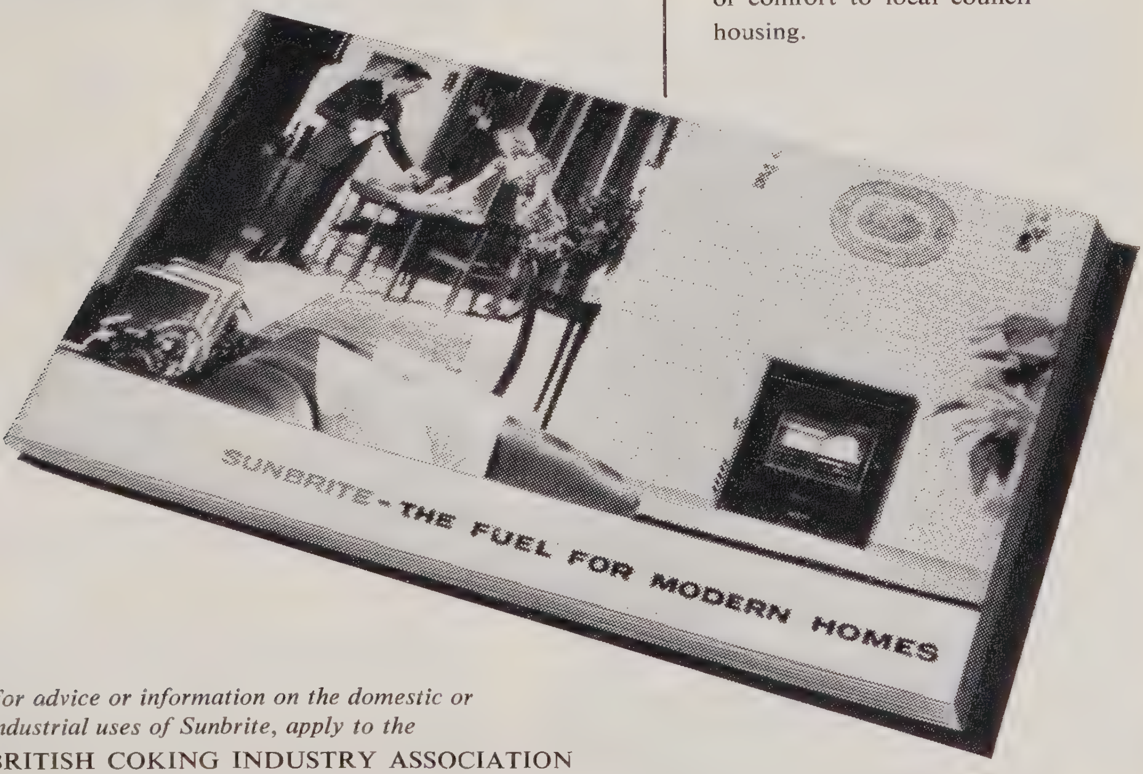

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"*Why do we put up with it?*": Per 100, 10s.; per 500, £2; per 1,000, £3 10s.

"*Smoke Affects your Wealth and Health*": per 100, 15s.; per 1,000, £6.

(Prices in brackets are special prices for Members)

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The Iron Fireman coal-burning Automatic Stoker will solve the problem of Smoke without the use of expensive fuels. The recognised method of burning bituminous coal is to use under-feed stokers, which are now an exempted class of appliance under a recent order made by the Ministry. Iron Fireman Stokers are thus being installed in many Smoke control areas throughout the country.

Iron Fireman

"FIRST AND FOREMOST"

Automatic Coal Stokers

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SMOKELESS AIR

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Ships, towers, domes, theatres and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

CRISIS OR CHALLENGE?

THE serious statement on smoke control areas, in the House of Commons on May 24, by the Minister of Housing and Local Government, was published in our last issue (p.278) but was too late for comment to be made. It will be recalled that Sir Keith Joseph said that open fire gas coke had been relied upon as the basic domestic replacement for raw coal for the smoke control area programme. He went on: "But owing to the rapid technological changes now taking place in the gas industry it is clear that a major increase in the production of gas coke can no longer be expected." This meant that "at a stage in the programmes varying from place to place additional supplies of open fire coke may cease to be available to meet the requirements of further smoke control areas".

This statement has created considerable consternation among the many local authorities which have been pressing ahead with their smoke control area programmes, and the word "crisis" has been heard. The Beaver Committee, on the report of which the clean air programme has been based, rightly concluded that the replacement of raw coal in the black areas must depend to a very large extent on gas coke. The more reactive and expensive fuels were helping but were limited in quantity and it was estimated that only ten per cent of the conversions in smoke control areas would be from solid fuel to electricity. Conversions to gas do not seem to have been regarded as significant. The report did however point out that

> "The advance of technology may bring changes in the economic and physical pattern of fuel availability. These cannot be foreseen and this assessment has been made on a realistic basis of what is available today in the economic conditions now ruling".

Until recently it has seemed that this 1954 analysis was continuing to be valid. There has been sufficient open-fire coke, the quality of which, through the adoption of a BS specification, has improved, and it had been assumed that this sufficiency would continue for some time to come, and this was the conclusion reached by the Peech Committee on solid smokeless fuels in 1960, though despite its reassurances it did reach the conclusion that it was desirable to popularize the openable stove and the use of hard coke.

Although there is so far no overall shortage of open-fire coke, or Gloco, as the BS quality is now generally named, it is always to be borne in mind that the smoke control area programme has still about four-fifths of the way to go. What appears to be the basic difficulty is not that the production of coke will suddenly fall, but that it is ceasing to rise and will in due course start to diminish.

The Minister, in the statement

referred to, went on to say that the Minister of Power and he were instituting a review of what he termed "the arrangements", including the practicability of encouraging the greater use of closed or openable stoves. Until an announcement is made of the outcome of this review it is difficult to assess the problem in detail, even though the general lines of the new policy that is required are plain to see.

The Alternatives

In a letter to local authorities in the northern region, reported on another page, the Minister of Housing and Local Government has said that supplies of open fire fuel, apart from those already earmarked for confirmed smoke control areas, cannot be expected. There has of course been a shortage of open fire fuels in the north-east black areas for some time, and grants have been permitted for the openable stoves that are more expensive to buy (though not to run).

The problem that has arisen so rapidly has been fully considered by the Society's Executive Council and Committees, and representations have been made to the Ministry that full grants should be available for openable stoves in all black areas, that equivalent grants should be made for gas room heaters and electrical or oil heating equipment up to similar sums, and that such alternatives should in fact be encouraged.

For those who are not familiar with the matter, it may be explained that at present (except in the northern region) the grant payable on conversions in new smoke control areas is restricted to the least expensive type of appliance comparable to the one being replaced. That is, if an old-style open fire is to be replaced, the grant will be 70 per cent of the cost of an improved open fire and its installation (perhaps only about £5). The grant cannot be increased if a more expensive appliance is preferred. If the householder spends £30 on putting in an openable stove instead of the £5 that would have served, he will receive only 70 per cent of the latter sum. If, as in the north he can claim grant on the full cost of an openable stove the incentive to install one will be greater, although the initial outlay by the householder will be increased and the cost to the local authority and to the central Exchequer will also rise.

Thus even though the technological problems may sort themselves out it will, in the short run, cost more than at present to create smoke control areas without, or with fewer, open fires. And yet, in the long run, it will be well worth while. As has been said before, any practical policy for preventing domestic smoke must cost less than what we lose by allowing it to continue.

Considerable re-thinking and effort to formulate the necessary new policy, and to secure its acceptance by the local authorities and the public alike, is called for if the already slow progress towards the completion of the smoke control area programme is not, for a time, to become even slower, But, provided the new situation is understood, the needs it creates are accepted, and every advantage is taken of the strong tide that is flowing for better heating in the home, the present hesitancy can be replaced by progress faster than before.

The Technological Background

The changes in the economic and physical pattern of fuel availability, regarded as possible by the Beaver Committee (or to give him his due, by the author the relevant appendix, the late Dr. G. E. Foxwell), which have created this new situation, are important and are to be welcomed both in the national interest and, again in the long run, in the interest of clean air. Gas is one of the most valuable of all the smokeless fuels, and not only is it smokeless but it is free from sulphur. The industry must strive to produce gas more cheaply and more abundantly, and new techniques and processes are making this possible.

There are the Lurgi and similar processes for the complete gasification of coal; there is natural gas being imported from the Sahara; and there is the production of gas from oil. The real cost of a fuel depends not only on its price but on the economy with which it can be used, and the development and popular success of the new highly efficient radiation plus convection gas heaters is as important as the new production processes. And then if underground storage (on which there will be a most informative paper at the Scarborough Conference) can be made available, the one big disadvantage of gas compared with solid fuel may be overcome—that is, ability to take on a bigger share of the space-heating load without trouble during cold weather peaks.

All these changes could be applauded without reservation by the clean air movement if it were not for the fact that they all mean less coke instead of more. But this will matter less than it did when the Beaver Report came out. Already in new smoke control areas up to 40 per cent of conversions are from solid fuel to gas, electricity or oil. This growth is fairly recent. If it can be helped to develop (the percentage perhaps even doubling), and if the openable stove can take the greater part of the remaining solid fuel requirements, using the ample supplies of hard coke, with the reactive smokeless fuels and gas coke earmarked for open fires, it should be possible to meet requirements in the black areas for a decade or more, without any disastrous slowdown.

The main problem, perhaps, is to make popular the excellent openable stoves, the value of which was discussed editorially in our last issue. The new kinds of stove, with their cheerful glass windows, have a much better chance of making a breakthrough in public acceptance than any of their predecessors. But it will need much advocacy and a major publicity campaign—for which the interests concerned could well afford to club together.

And it must not be overlooked that the gas industry, though taking away with one hand, is giving something better with the other. Oil is likely to assist more, with its competitors, in the developing central heating market. Electricity can help best (and after recent criticisms may prefer to do so) by off-peak night storage and floor heating, rather than pushing higher its peak loading with radiant heaters.

These growths and changes needed for the continued success of the smoke control programme are fortunately also needed to meet the profound changes that are in progress in the British way of life in the whole field of house heating and comfort. The clean air movement seems to be faced with a situation that can be allowed to become a crisis or can be turned into a splendid opportunity.

Fuel Abstracts

Fuel Abstracts and Current Titles, which is published monthly and was inaugurated by the Institute of Fuel after the Fuel Abstracts of the Fuel Research Station, D.S.I.R. ceased publication, has now been published successfully for three years.

The publication has become most valuable, and is well and authoritatively produced. We are glad to make known an invitation to new subcribers, and are sure there must be a number of our readers who would find it helpful both for current awareness and retrospective searching in the whole field of fuel (including atmospheric pollution). Information from the Secretary, Institute of Fuel, 18 Devonshire Street, London W.1.

We regret to record the death, on May 2, 1963, of G. Vivian Davies, A.M.I.Mech.E., F.Inst.F., F.R.S.A. Mr. Davies was well-known as a fuel technologist, and was Chairman of the Industrial Fuel Economy Group. He was a member of the St. Marylebone Borough Council.

SMOKE CONTROL IN THE NORTHERN REGION

Ministry's Letter

The Minister of Housing and Local Government has sent the following letter (dated August 1, 1963) to all local authorities in the Northern Region. After referring to the Department's earlier letters about appliances capable of burning hard coke, the letter continues:

2. In the Northern Region, production of smokeless solid fuels suitable for use on open fires has for a long time been substantially less than in most other parts of the country. As a result of the Government's discussions with the producers, to which the letter of 9th June 1961 referred production in the region is greater now than in 1961. But both the actual and the estimated demands for smokeless open fire fuels have meanwhile gone on increasing rapidly as more and more smoke control orders have been made and confirmed. Where new orders have already come into operation, householders using solid fuels have gone on relying on open fires to heat their rooms; and in estimating fuel requirements for further orders local authorities have assumed that the open fire would continue to be used to much the same extent as hitherto.

3. In the Northern Region stoves capable of burning hard coke have been eligible for full grant under the Clean Air Act since June 1961 and since March 1962 other appliances burning hard coke have also been eligible. It was hoped that these grant concessions would lead to a much wider use of hard coke, thus relieving pressure upon the limited supplies of open fire fuels, but little use has been made of the concessions.

4. As local authorities know from the Department's circular letter of the 28th May, the Minister stated in reply to a Parliamentary Question on the 24th May that in consultation with the Minister of Power he was reviewing the current arrangements under the Clean Air Act in the light of the rapid technological changes now taking place in the gas industry, and that he would keep local authorities informed of the progress made. It should however be assumed in this connexion that no more supplies of smokeless solid open fire fuels can be made available in the Northern Region than are already earmarked for areas covered by confirmed smoke control orders.

5. If therefore the same reliance as hitherto continued to be placed on open fires in smoke control areas in the Northern Region, the Minister would not be justified in confirming the orders submitted by local authorities in the Northern Region that are now before him, because the demand for open fire fuel created would exceed the supply.

6. There is however no overall shortage of smokeless fuels in the Northern Region. It is only solid open fire fuels which are short. Some of the alternative smokeless fuels are in abundant supply; in particular there is plenty of hard coke. Price trends and the development of new appliances are resulting in gas, electricity and oil becoming increasingly competitive in running costs as compared with the smokeless open fire fuels.

7. The Minister therefore suggests that local authorities in the Northern Region who have submitted smoke control orders that now await his confirmation should review the fuel estimates submitted with these orders in consultation with the local representatives of the fuel and power industries and with the householders affected by the orders, with a view to eliminating the demand for open fire fuel and replacing it by demand for alternative smokeless fuels. In areas covered by orders which have been confirmed but have not yet become operative the Minister suggests that the local authorities in conjunction with the fuel and power industries should do their best to ensure that domestic conversions not yet effected should as far as possible be conversions to the alternative fuels. The fuel and power industries have been informed of these suggestions by the Minister of Power and have been invited to co-operate with local authorities for these purposes.

8. When local authorities have completed their reviews, they are invited to submit to

the Minister their revised estimates of requirements and the fuel industries' offers to supply.

9. Under paragraph 26(8) of the Memorandum on Smoke Control Areas, as revised in Annex C of Circular No. 3/62, it is a principle that reasonable freedom of choice should be given to the owner or occupier as between solid fuel, gas, electric or oil burning appliances provided that the total costs are broadly comparable in each case. Local authorities in the Northern Region who are in any doubt how this principle should be interpreted in any particular case in present circumstances are invited to consult the Minister's officers. More detailed general guidance on this point will be issued later.

10 Without prejudice to the upshot of the review referred to in paragraph 4 above, the Minister suggests that for the time being local authorities in the Northern Region should prepare any further orders on the assumption that they will need to be based upon the use of smokeless fuels other than those suitable for open fires.

11. Local authorities preparing new housing schemes in areas covered, or likely to be covered, by smoke control orders will recognize that it is in their own interests to install at the beginning heating and cooking appliances for which adequate supplies of fuel are likely to be available. Advice on suitable appliances can be obtained from the fuel advisory bodies.

NEW AUTHORIZED FUEL

A new order has been made under the title The Smoke Control Areas (Authorized Fuels) Regulations 1963. (S.I. 1963, No. 1275). It declares to be an authorized fuel in England and Wales for the purposes of the Clean Air Act, 1956: "fluidized char binderless briquettes manufactured by the National Coal Board."

The fuel is of course the new fuel that is being produced from the pilot plant at Birch Coppice, and which has unofficially become known as "Bronowski's bullets". We understand that the name it is to be given is "Homefire".

LORD ROBENS AND SMOKELESS FUEL

"Penny Farthing Arrangements"

Much publicity was given to a reply to a question put to Lord Robens, chairman of the National Coal Board, at a meeting at Falkirk on August 15. Asked about a Ministry of Housing circular dated August 8 suggesting that there might be a shortage of smokeless fuel, Lord Robens is reported to have said that there was plenty. "We have mountains of it—something like four million tons." He was also reported to have said that there was a shortage of appliances, and that "In most houses the fireplace arrangements can only be compared with the penny-farthing bicycle."

There are clearly some misunderstandings or reporting errors somewhere. There was no Ministry circular on August 8, although the questioner may have meant the one to the northern local authorities of August 1. And the anxiety expressed is of course about *open-fire* fuels, whereas Lord Robens was referring to hard coke suitable for *closed* appliances, which is in abundant supply—hence the drive to popularize the openable stove or room heater.

On the comment that appliances were not available, one of the leading manufacturers, Allied Ironfounders, have pointed out that their present production is fully geared to demand and could be quickly increased. The sales director, Mr. T. L. Reed, said that he had spoken to Lord Robens about his statement, and "he told me that his reference to a shortage of appliances referred to a shortage of appliances where they were most needed—which is in the homes of the people."

Scottish Conference

Address by Minister

A successful two-day conference of the Scottish Division, attended by about one hundred delegates, was held in Inverness on May 23 and 24, Councillor W. Monteith, of Glasgow, was elected President of the Division in succession to Mr. John Innes, who had held the office with distinction for a number of years.

The conference was welcomed by Provost Allan Ross of Inverness, and among the speakers were H. L. Nicholson of the Scottish Branch of the Warren Spring Laboratory, on "The Measurement of Grit and Dust from Chimneys", Dr. L. E. Reed, of Warren Spring, Stevenage, on "A Guide to the Appraisal of Chimney Heights", and Dr. J. S. G. Burnett, Chairman of the Society's Technical Committee and Medical Officer for Preston, on "The Problem of Diesel Smoke".

The highlight of the conference was an address at the opening session by the Rt. Hon. Lord Craigton, Minister of State.

Lord Craigton said that since the passing of the Clean Air Act in 1956, great progress had been made in bringing the menace of smoke under control. In the industrial field, indeed the success had been so great that it had, in many areas, shown up all the more glaringly the extent of the smoke problem caused by the ordinary house chimney. The man in the street, however, was beginning to appreciate the need for some form of control and to appreciate the benefit it would bring to himself and others, particularly where illnesses such as bronchitis were concerned.

After giving a comprehensive account of the manner in which the problem was being tackled by means of smokeless fuels, modernization of old-type fireplaces, "smoke control" programmes, etc., Lord Craigton said: "All of us in public life, whatever our difference in some fields, are united in our determination to project to the world the live image of Scotland as a virile and progressive nation: a nation capable of making its own way in this modern world and unrivalled as a country in which to live, to work and to play. It is being increasingly brought home to us that this image depends not only on our history and traditions, or the beauty of our countryside or the reputation of our staple industries. It depends more and more on the amenity and grace of the towns and cities in which the majority of our people live. And amenity and grace are not the outstanding features of many of our industrial towns to-day."

Other features of the conference were a visit to the Fasnakyle hydro power station, and a delightful reception, with Scottish music, given by the Provost and Council of Inverness.

Shut Down Order

Drastic methods to deal with a recalcitrant factory have been reported from Western France. The Appeal Court at Rennes decided that the firm of Guyomarch et Pognant, which employs 120 people in the production of meat foodstuffs, was causing too much atmospheric pollution. In addition it was creating a most unpleasant noise nuisance. They ordered that it should be closed down.

The factory is the principle importer for the port of Vannes. In addition the company is to pay 1,000 francs to each of the four plaintiffs who instituted proceedings and the order to close must be complied with in the next four months or the company will pay 200 francs per day for remaining in operation.

Dr. A. J. Shinnie. A memorial service for Dr. Andrew James Shinnie, former Medical Officer of Health for Westminster, whose death was reported in our last issue, was held on July 12, in the chapel of Westminster Hospital. An address was given by Mr. Stanley E. Lee. The National Society for Clean Air was represented by its Director.

EUROPEAN CONFERENCE ON AIR POLLUTION

At Strasbourg in May 1964

As reported in our Spring 1962 issue, the Social Commission of the Council of Europe had recommended a European conference on air pollution. The proposal was accepted by the Consultative Assembly, and preparations are now actively in progress for the conference to take place next May.

In a statement from the Council of Europe it is stressed that the conferences that have been held in most European countries have usually had technical or scientific objects in view, but that the forthcoming conference will be on quite different lines. "It is not intended that the conference should attempt to find in one week solutions to problems that technicians in many countries or in better qualified organizations have been studying for years".

The aims of the conference are to survey what has been done; to examine possible methods of promoting or encouraging co-operation between existing European bodies; to explain the problem to the general public to obtain the support of public opinion, political circles, etc., and to seek agreement on specific points.

The conference will last for eight days (opening on May 20) and will consider an agenda of 14 points. For each point each of the countries represented has appointed a rapporteur. These have been asked to send to the Secretariat a report on their particular subjects, covering (*a*) the methods used in their country; (*b*) the results achieved; (*c*) current programmes; and (*d*) projects under consideration. These national reports will be sent to the General Rapporteur for each point, who will prepare a collective report. The 14 collective reports will then be translated, published and distributed in advance for study by all the participants in the conference who have expressed a desire to receive them. Only the conclusions of the reports will be submitted to the conference itself for discussion.

The conference will finally adopt selected reports and consider resolutions asked those concerned (governments, industry, local authorities, etc.), to take such steps as the conference as agreed are advisable.

It is interesting to note that it is expected that the conference will be opened by an inaugural speech by a Minister from the United Kingdom: a tribute to the pioneer work on the problem by this country.

The agenda is a very full one, covering a wide field that includes the effects of air pollution (human, plant life and economic); danger thresholds; methods and standardization of measurements; meteorological and geographical factors; methods of reducing pollution from industrial and domestic sources, from motor vehicles, and in specific industries; town and country planning aspects; organization of European co-operation in research, standardization, etc., methods of informing and educating the public; and comparison of national laws and regulations.

There will be an introductory statement by a representative of the World Health Organization and reports will also be presented by American delegates on the work being done and the point of view of the U.S.A.

The organization is being effected through the governments and government departments of the interested countries and to a large extent the rapporteurs who will make up the conference are official representatives. Those from the United Kingdom are Dr. A. E. Martin (Ministry of Health), K. N. Burns (Ministry of Agriculture), P. D. Coates (Ministry of Housing and Local Government), Dr. S. R.

(*concluded on page* 24)

POLLUTION FROM COLD BLAST CUPOLAS

Discussions have taken place between representatives of the Midlands Joint Advisory Council and the Technical Panel on Clean Air of the Joint Iron Council, with reference to Section 5 of the Clean Air Act (minimization of dust and grit). A memorandum has been sent by the Council of Ironfoundry Associations to its member firms and also by the Midlands Joint Advisory Clean Air Council to all its constituent members. The memorandum is as follows:

The following recommendations are the outcome of discussions between the Council of Ironfoundry Associations and the Midlands Joint Advisory Clean Air Council.

Practicable Means for Suppressing Grit and dust from Cold Blast Cupolas

1. *Cupolas worked up to* 250 *hours per annum*—Dry arrester.
2. *Cupolas worked between* 251 *and* 750 *hours per annum*—

   Wet or dry arrester subject to site conditions and local circumstances All new dry arresters must be capable of easy conversion to wet arresters.
3. *Cupolas worked for* 751 *hours or more per annum*—

   Wet arrester (except where water supplies are not available).

Explanatory notes concerning the recommendations

In a comparatively small number of instances, particularly where dirty scrap is melted, although there is a diminution of grit and dust brought about by the fitting of a wet arrester, there may still be an emission of smoke.

Whilst there will be a reduction in the emission of grit and dust by the use of wet arresters, it is pointed out that this is only a guide to meet the requirements of Section 5 of the Clean Air Act, 1956, and the question of the adoption of the recommendations in a particular instance is a matter for the decision of the Local Authority on the advice of the Chief Public Health Inspector.

Although, as is mentioned above, the wet type of arrester offers a considerable improvement over the dry type of arrester with a baffle, it is not intended that the wet arrester shall preclude any installation which may be developed in the future having regard to the definition of "practicable" used in Section 5 of the Clean Air Act, 1956, and defined in Section 34(1) as "means reasonably practicable having regard amongst other things, to local conditions and circumstances, to the financial implications and to the current state of technical knowledge, and 'practicable means' includes the provision and maintenance of plant and the proper use thereof."

"Compliance with the Clean Air Act"

The Institute of Fuel is publishing in its journal a series of articles on the theme of "Compliances with the Clean Air Act". Abstracts are given in our Abstracts section of the first and third of these articles, by Arnold Marsh and Dr. P. J. Lawther respectively. The second article, by F. E. Ireland, is reprinted in full on other pages.

The Institute is to hold a meeting in London on Wednesday, November 27, at which the series as a whole will be discussed. The meeting is open and non-members may obtain details from the Institute at 18 Devonshire Street, London, W.1. Further articles will be on "Coke-burning Appliances: Pointers to Improved Design", by W. C. Moss, and "Smokeless Combustion of Coal for Domestic Purposes", by the President of the Institute, Professor M. W. Thring.

European Conference—*concluded*

Craxford (D.S.I.R., Warren Spring), Brigadier N. H. L. Chesshyre (Ministry of Transport), Dr. F. Pasquill (Meteorological Office), Dr. E. A. J. Mahler (Alkali Inspectorate), and Arnold Marsh (National Society for Clean Air). The last named, the one non-government representative, was invited to participate in the information and public education section because of the work and experience of the N.S.C.A. and the long publication of this journal.

18,000,000 Cars by 1980

WHY NOT CARLESS ZONES?

by Arnold Marsh

TO begin with, it must be emphasized that this is a personal and not an editorial article. It must be introduced in a personal way too, for it stems from holiday experiences and impressions. These have included a stay in the unique, bewitching city of Venice, and one high in the Swiss Alps, in the little town of Saas-Fee. These two places, so vastly different in their nature, their surroundings and their history, have one unusual feature in common. It is a feature which one may know of beforehand, but which only the experience of living in them for a time makes real and important.

They are both free from motor traffic.

There may of course be other places equally fortunate (Zermatt for instance) but here we need not look beyond what we know. In Venice, all motor vehicles crossing the causeway from the mainland are parked in garages on the edge of the city. They could not penetrate far in any case, and the result is that the great squares (the *campi*), the streets and the quaysides never see a wheeled vehicle. True, motor boats and motorized barges are darting or chugging along the major canals, but these do not intrude as does the road vehicle that has to be watched and avoided and which discharges its exhaust at close range.

In Saas-Fee, high among the snow-capped peaks and glaciers of the

Saas-Fee—the carless centre

The Campo of S. Stephano, Venice

Valais, a village has grown in recent years into a bright and popular centre for walkers and climbers in the summer and for winter sports. It was only a few years ago that a motor road was cut up from the valley below, and this has been firmly halted on the outskirts of the town, where there is a terminal for the buses and parking space for cars. No traffic is allowed into the narrow lanes and passage ways of the town. The only exceptions seen were a small municipal refuse collector and an ambulance. The mail is transferred from the buses to a horse-drawn cart on its way to the post-office, and every shop and hotel has its hand-drawn four-wheeled trolley or truck to bring in supplies and the luggage of visitors.

It takes time to become aware and to savour why these two towns should be so different from others; why there is so pleasurable an absence of fumes and smells, and of mechanical noise; and why there should be so strong a sense of freedom and release in walking in them. Then comes the realization that it is the complete absence of cars, lorries, motor-cycles and scooters.

And how one grows to delight in the difference: watching children playing without danger in the piazza or the twisting lane; watching the equally relaxed promenading of the grown-ups in the evening and noting the lifting of traffic anxiety from the elderly and infirm; sitting at an open-air café without the roar and screech of passing traffic; breathing air free from exhaust pollution; viewing every scene without the otherwise inevitable clutter of parked vehicles.

It has recently been reported that the Road Research Laboratory estimates that by 1980 the number of cars on the roads of Britain will be 18 millions, or three times the present number. It is a prospect that few will look forward to with pleasure. And geared as we are to an economy that is more and more dependent on an increasing production of motors of all kinds, with perhaps both railways and bus services continuing to spiral down towards extinction, it is difficult to see how this trend could be changed.

Entrance to Saas-Fee—with the road sign, cars and motor cycles prohibited

There will thus be a serious increase in both air pollution and in noise, due not only to the actual increase in the number of vehicles but also to more widespread congestion.

Even now it is for many a relief to get away to where the motor vehicle cannot follow, and the need for such escape must grow from year to year. Only a few, and they only for brief periods, can take to the roadless moors and hills. But, one wonders, is it not possible to follow the example of Venice and Saas-Fee, and set up, here and there, zones or areas or districts in which all motor vehicles are prohibited? Like the smokeless zones the carless (or carfree) zones could at first be small—selected villages, town centres, around some of the cathedrals, in areas of historic or natural importance. Already, in the pedestrian precincts of the shopping centres of new or rebuilt towns we can see small—relatively very small—examples of this idea.

It will of course be argued that such zones, on any worth-while scale, would be impracticable, uneconomic, bad for commerce, hard on car-owners, and so on. Maybe; or maybe not. Ask the hoteliers of Saas-Fee. But in terms of human felicity and serenity there is no doubt about their worth.

Moreover, as the streets become still more thronged, such oases of clean air and quiet may well become a new kind of therapeutic spa, to be prescribed for recuperation from the effects of the eighteen million cars.

NEW SYSTEM OF COMBUSTION

The Combustion Engineering Association has published a report of a meeting in London on May 28, last, at which a paper was given by A. A. Godal, of France, on "Ignafluid, a New System of Combustion". This has been developed on the continent and is now used in 20 plants, together providing 850 million Btu. per hour.

Fine coal is fed continuously through an air-blown adjustable coal injector located in front of the combustion chamber. Mechanical means to feed the coal are not required. The grate is inclined and air forced under pressure at the far end creates a fluidized condition in the burning fuel bed, which is constantly maintained by the fresh fuel. The fuel bed, stated M. Godal, looks very much like boiling volcanic lava.

Grit emission at the chimney has to be prevented by the use of suitable dust collectors. The tubular or centi-cell type of collectors are entirely satisfactory for this purpose and will give an efficiency of 95 per cent, which it was said was satisfactory for Clean Air Act requirements.

The same report also contains a paper by H. J. Bergmann on "Modern Continental Boiler Design and Practice". Another C.E.A. report is on its conference at Harrogate in November, 1962, on "Getting the best out of liquid fuel". The Association will hold another conference in Harrogate on November 20 and 21, 1963, on "Coal and the Future". Lord Robens will be among the speakers.

A Pine to Withstand Pollution

After trials near Haslingden lasting 13 years, the Forestry Commission believe they have found a tree that will grow on the east Lancashire moors.

It is an American pine (*Pinus contorta*), which alone among many species tried has survived for more than a year.

Trees have died not so much because of the bleak, high ground but because of sulphur dioxide in the air from south-west Lancashire—more than in the centre of Manchester.

Mr. D. Windle, forester in charge of the planting, said many kinds of tree grew well the first year, but wilted away as soon as the sulphur dioxide affected them. "Even in July you can see acid burns on the leaves", he said.

During the next 15 years the commission plan to plant 1,500 trees on 600 acres in the Haslingden area.—*The Times.*

THE TECHNICAL BACKGROUND LEADING TO THE MINISTRY'S MEMORANDUM ON CHIMNEY HEIGHTS*

By F. E. Ireland, B.Sc., F.R.I.C., M.I.Chem.E., M.Inst.F.

Deputy Chief Alkali Inspector†

This article, reproduced with acknowledgments from the Journal of the Institute of Fuel is the second of series of articles on "Compliance with the Clean Air Act". (See also note on p. 24) The paper assumes that the reader is familiar with the Memorandum on Chimney Heights. It describe the complications involved in any purely mathematical approach and the simple basic graph which is used to relate sulphur dioxide emission to chimney heights which had been found to be acceptable in practice. Adjustments are made for five different categories of district by considering the rate of sulphur dioxide emission as increased or decreased by certain percentages according to the type of area. The adjustments vary between plus 60 per cent and minus 45 per cent. For equivalent amounts of sulphur dioxide from average coal and oil the plume rise due to buoyancy is less for oil than it is for coal and a correction factor is used. Finally, there is a formula for adjusting the chimney height to allow for the effect of downdraughts from adjacent buildings on the dispersal of the plume.

1. INTRODUCTION

1.1. Historical

SECTION 10 of the Clean Air Act requires local authorities to reject by-law plans which include proposals for new chimneys (other than chimneys serving residences, shops and offices), unless satisfied that the chimneys will be high enough to prevent smoke, grit, dust, or gases emitted by the chimney from being a nuisance or prejudicial to health. There is a right of appeal to the Minister of Housing and Local Government against the rejection of plans. The section has been difficult to apply because of the trouble local authorities have in deciding the right height for a proposed chimney. Paragraph 16 of the Ministry of Housing and Local Government's Memorandum on Miscellaneous Provisions of the Clean Air Act referred local authorities for guidance about the technical considerations governing the heights of chimneys to Appendix VI to the Report of the Committee on Air Pollution (Cmd. 9322 of 1954), known as the Beaver Report. To persons unused to making these calculations Appendix VI is complex and uncertain. From time to time articles by experts appear in the technical press advocating the use of particular formulae to calculate chimney heights. Such formulae are often of great complexity and even the simplest require specialized knowledge before they can be applied. Early in 1959 a working party was set up under the chairmanship of the Director of the Warren Spring Laboratory of the Department of Scientific and Industrial Research, to formulate more precise recommendations and its report was submitted to the Ministry of Housing and Local Government in August, 1961. Generally the recommendations were accepted by the Ministry as technically sound and they have been used by the Ministry as the basis for the Memorandum on Chimney Heights. It is assumed that the reader is familiar with the Memorandum. The basic principles governing the recommendations were that pollution downwind of a new chimney should not exceed some limit, and that pollution from the chimney must be considered in relation to pollution that already existed from other sources.

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* Memorandum issued by the Ministry of Housing and Local Government and the Scottish Development Department, "Clean Air Act, 1956. Memorandum on Chimney Heights." H.M.S.O., 1963, price 1s. 3d., accompanied by explanatory Circular No. 25/63, price 3d.

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1.2. Scope of the Memorandum

The limits shown for steam production and fuel consumption are those recommended by the working party. Industrial boilers having an aggregate maximum continuous rating of not less than 450,000 lb. of steam per hour, normally fired by solid or liquid fuel and used for the generation of electricity, were scheduled under the Alkali Act in 1958. It follows that this rating sets the practical upper limit of direct responsibility of the local authority.

1.3. Amount of Sulphur Dioxide Emissions

Given the necessary data this is a simple calculation but it is surprising how often in practice neither the local authority nor the user knows the sulphur content of the fuel. As a guide the average sulphur contents of British coal and residual fuel oils are given as 1·6 and 3·0 per cent respectively. Wandless[1] analysed the sulphur content of coal seams in Great Britain and his table of results should be consulted by those who need to use the weighted averages for particular areas of the country when the sulphur content of the coal to be used is not known. Wherever possible the actual sulphur content of the fuel should be used to calculate sulphur dioxide emissions, because Wandless's results show that even with coal seams of low average sulphur content, below say one per cent, the range is quite widespread and the maximum is usually over three per cent.

2. METHOD OF CALCULATING CHIMNEY HEIGHTS

2.1. Uncorrected Chimney Height

From the present state of our knowledge it is not possible to give a simple formula which will define the precise suitable height of a new chimney in scientific terms. There are many variables, often inter-dependent, to take into account and many schemes have been put forward by the specialists for making calculations but when an involved mathematical exercise has been successfully accomplished there is no guarantee that the answer is any more correct than one derived by a much simpler calculation. It should be remembered that sulphur dioxide is being used as a yardstick for a complicated mixture of pollutants both gaseous and particulate. Emissions from burning of fuel can also contain sulphur trioxide, oxides of nitrogen, carbon monoxide, alkali salts, soot, hydrocarbons, and a whole host of trace elements including fluorine, beryllium, arsenic, selenium, boron, vanadium, germanium, and so forth, compounds which nearly exhaust the periodic table, not forgetting the two main constituents, nitrogen and carbon dioxide. So it would not be correct to carry out a calculation based solely on sulphur dioxide emission without relating the answer to what has been found in practice to give acceptable ground-level conditions. The Ministry of Housing and Local Government had to be sure that the recommendations met this latter requirement. Maximum acceptable concentrations of pollution have not yet been defined in this country and indeed physiological response to small concentrations of pollutants varies enormously. Parameters for wind speed, meteorological conditions, lapse rate, gas temperature, rate of diffusion or spread of plume, etc., must obviously be averages in any simple analysis, because it is the adjustments for the many variables or site peculiarities which can make the determination so complicated. Most of the accepted formulae for calculating ground-level concentrations are based on the Sutton diffusion formula and the results give maximum time-mean concentrations for three minutes, but measurements of ground-level concentrations are usually taken over a period long enough to give an average concentration, and tables have been prepared relating measured long-term averages to short-term calculations. The number of different answers which can be obtained for the determination of the height of a new chimney would seem to be limited only by the number of different formulae used and the number of specialists making the calculation. In their wisdom the working party overcame this major difficulty by producing two simple graphs relating sulphur dioxide emission to chimney height for an isolated chimney in a level built-up district. There were no qualifications. This was indeed an important achievement from a group of specialists and was accepted by the Ministry, as the graph conformed closely to that used by its own Alkali Inspectorate for many years. The Inspectorate's graph was probably the first attempt to apply theoretical considerations of diffusion to industrial practice. It used the 1936 formula of Bosanquet and Pearson as a tool to relate sulphur dioxide emissions to acceptable chimney heights by choosing suitable parameters. The graph has been used for many years in the field of the heavy chemical and related industries and had stood the test of time before the presently accepted formulae were evolved. There existed therefore ample evidence that the new graph would be suitable. Anyone wishing to know the maximum ground-level concentration resulting from use of the graph can make their own calculations, using the formula of their choice and putting in their own values for the parameters. The author's own calculations result in a three-minute, time-mean concentration of about 16 p.p.h.m. of sulphur dioxide for a warm emission and taking buoyancy into account.

For simplicity it was decided to present the working party's recommendations in the form of nomograms. Category C (see Table 1) corresponds to the type of district which the working party defined for their graph, *i.e.* an isolated chimney in a level built-up area, and the first step was to draw the nomogram using C as the focal point. The second step was to amend this height if necessary to take account of neighbouring sources of emissions, background pollution and surroundings. Typical situations were examined in practice and estimations were made of the effect of existing emissions on new sources. Results were averaged for heavy industrial areas such as can be found in the large manufacturing centres (Category E), and for intermediate areas (Category D). Likewise new sources of pollution in isolated and undeveloped areas were considered to be capable of operation under less stringent conditions and Categories A and B represent areas where some relaxation could be allowed. These adjustments took the form of considering the sulphur dioxide emission represented by Category C as increased or decreased by a certain percentage according to the type of area. Table 1 shows the adjustments together with the average maximum ground-level concentrations produced for a three-minute mean as calculated by the author.

TABLE 1.—ADJUSTMENT OF SULPHUR DIOXIDE EMISSION FOR TYPE OF DISTRICT IN WHICH THE NEW CHIMNEY WILL BE SITED

Type of district	Adjustment per cent	Average max. g.l.c. p.p.h.m.
A	— 45	20
B	— 22½	17·5
C	Basic	16
D	+ 30	15
E	+ 60	14

Note: The types of district represented by the letters A to E are defined in the Memorandum. They are:

A An undeveloped area where development is unlikely, where background pollution is low, and where there is no development within half a mile of the new chimney.

B A partially developed area with scattered houses, low background pollution, and no other comparable industrial emissions within a quarter of a mile of the new chimney.

C A built up residential area with only moderate background pollution and without other comparable industrial emissions.

D An urban area of mixed industrial and residential development, with considerable background pollution and with other comparable industrial emissions within a quarter of a mile of the new chimney.

E A large city, or an urban area of mixed heavy industrial and dense residential development, with severe background polution.

2.2. Adjustment for Oil-fired Plant

The nomograms are based on sulphur dioxide emission and the average sulphur contents of British coal and residual fuel oil are 1·6 and 3·0 per cent respectively. On average, for equal amounts of sulphur dioxide released to air twice as much coal is burnt as oil, *e.g.* three tons of sulphur dioxide are emitted by 100 tons of coal or 50 tons of oil. Nonhebel[2] shows that under normal combustion conditions 1 lb. of coal gives 190 ft.^{3} of flue gases and 1 lb. of oil gives 290 ft.^{3}. From the graphs in Nonhebel's paper the comparative plume rises for coal and oil are shown in Table 2 for a flue-gas temperature of 300°F. (149°C.).

Table 2 shows that for equal amounts of sulphur dioxide released to air on average the plume rise for oil is less than that for coal and that a correction based on addition of a percentage of the chimney height should vary according to the figures shown in the final column. However, such accuracy is not necessary and as a simplification an overall addition of 10 per cent on the uncorrected chimney height has been introduced for oil-fired plant. The correction is limited to the use of oil containing more than two per cent of sulphur so as not to penalize plant designed to use distillate oil fuels of low sulphur content.

2.3. Calculation of Final Chimney Height

The working party recommendations contained a correction to allow for the effect of downdraught on the dispersal of the plume. The formula can be expressed in the form

$$H = 0{\cdot}56A + 0{\cdot}375B + 0{\cdot}625C$$

where H = final chimney height
A = building height or greatest length, whichever is the lesser
B = building height
C = uncorrected chimney height.

TABLE 2.—COMPARATIVE HEIGHTS OF PLUME RISES FOR COAL AND OIL.

lb SO_2 per h	Coal		Oil		Difference in plume rise, ft	Uncorrected chimney height (C) ft	Difference as per cent of chimney height
	lb/h $\times 10^3$	Plume rise, ft	lb/h $\times 10_3$	Plume rise, ft			
60	2	28	1	24	4	76	5·3
150	5	50	2½	42	8	91	8·8
300	10	80	5	66	14	109	12·8
600	20	125	10	102	23	140	16·4
1 500	50	210	25	172	38	200	19·0

Appendix V of the Memorandum is merely the addition of these three expressions on the right-hand side of the formula.

The basis of this relationship is explained by Lucas in the discussion to the Scorer and Barrett paper[3] mentioned as a reference for further reading at the end of the Memorandum.

3. CONCLUSION

As the Memorandum states in its opening paragraph, the object is to provide a relatively simple method of calculating the approximate chimney height commonly desirable in normal circumstances. In practice there will often be found site and topographical complications which are impossible to assess sufficiently precisely by experience and mathematics to satisfy local authorities and designers that the correct height of chimney has been chosen. The answer is to have wind-tunnel trials carried out on scale models, especially where large plants with massive emissions are being considered.

4. ACKNOWLEDGMENT

This paper is presented with the permission of the Ministry of Housing and Local Government. Acknowledgment and thanks are made here for the helpful criticisms and suggestions of the many interested organizations to whom the draft Memorandum was circulated before it reached its final form.

5. REFERENCES

[1] Wandless, A. M. The Occurrence of Sulphur in British Coals. *J. Inst. Fuel*, 1959 (June), **32,** 258.

[2] Nonhebel, G. Recommendations on Heights for New Industrial Chimneys (with discussion). *J. Inst. Fuel*, 1960 (Oct.), **33,** 479.

[3] Scorer, R. S., and Barrett, C. F. Gaseous Pollution from Chimneys. *Int. J. Air. Wat. Poll.*, 1962, **6,** No. 1, 49 to 63, with discussion, No. 2, 85 to 100.

Electrical Supply Growth

Although there has been a twenty-fold growth in electrical energy generation in the last forty years there is now ample reason for concern that this growth may not continue at the same accelerated pace. This was stated at the British Electrical Power Convention at Torquay in June, by Dr. Philip Sporn, of the American Power Company. He was giving the Citrine Lecture, which was established last year as a mark of appreciation of the work of the Convention done by Lord Citrine.

Speaking of electricity in the home, Dr. Sporn said:

"The existing devices provide a solid basis for developing the average completely electric home as a 20,000 to 25,000 kWh per year customer. The home, however, needs to be studied and researched as a system, both physically and economically. Physically it should be possible to integrate many of the out-of-sight, out-of-mind functions like hot water, air conditioning, etc. Economically these functions may be saleable much more easily as monthly services supplied by the utility instead of as a capital investment by the owner. The energy itself could be treated either as part of the service or as part of the energy bill.

"There are a number of areas where major energy using devices need to be researched and developed. These include such functions as incineration, sewage disposal, water purification, environmental control.

"Lighting has been neglected in the home. The idea of conflict between aesthetics and levels of illumination needs to be resolved by more ingenious designs and concepts of placing and distributing light.

Cement Dust Rate Appeal

The owner of a house in Dartford, who had complained of increasing dust deposits from a cement works a mile away, had his appeal for a rating reduction dismissed by the Lands Tribunal.

THE NORTHERN ENVIRONMENT

The City Architect of Sheffield, J. L. Womersley, C.B.E., F.R.I.B.A., M.T.P.I., in a lecture to an R.I.B.A. conference at Sheffield in July last, spoke strongly about the environment of the North. In this section of his address he said:

Anyone who travels from London to Yorkshire must notice the complete change of environment after he gets to Nottingham. The green meadows, clean rivers and unspoiled landscape change to a landscape pitted with colliery waste heaps, outworn and disused pit-head works, derelict factories, belching chimneys and industrial waste littered not over acres but over square miles. The very air is 10 shades darker. It is, let's face it, very much like going from heaven to hell.

Thank God, says the Southerner, I don't live up here! Even some of you didn't want to come to Sheffield for this Conference—"let's be escapists", you said, "and go to Torquay". Whilst you are up here take a run in the train from Sheffield to Leeds—or go by road through Staveley to Bolsover. I don't know what effect it will have on you, but it makes me extremely angry that in 1963 people have still to inhabit such a sordid and blighted environment. Not only does it afflict the eye, but for many it afflicts the nose and the ear throughout their daily lives.

The North, however, is not all squalor. Cheek by jowl with some of the slag-heaps lie beautiful hills and woods. In Sheffield itself you can get out of hell and be in heaven in a very few minutes—whilst you Londoners are getting yourselves packed into your underground trains in fact. Bolsover Castle, majestically sited, looks down upon a plain of fantastic contrasts. And it is in the contrast of the blemished beauty of the North with the cancerous congestion of the South East—that the key to our problem lies. It is surely by making the Industrial North more attractive to live and work in that we can check the drift to, and ease the congestion of, the South East.

It may indeed, be the only way to ensure that these Northern areas and their essential and costly industrial establishments retain their workers. Because in the second half of the twentieth century people will have no truck with the philosophy preached to their grandparents that "where there's muck there's brass". They know that where there is muck there is waste and inefficiency. The people of today and tomorrow will, quite rightly, demand a good working environment as well as a good home environment.

The Cost of Corrosion

In our last issue (p.300) we quoted some figures given by Mr. Morris T. Shaw on the cost of corrosion in a lecture given in Belfast. Mr. Shaw estimated that the total annual cost of corrosion to the U.K. was £600 millions.

In his Presidential Address to the British Association of Corrosion Engineers in London on July 4, Mr. Shaw again quoted these figures, and in mentioning National Productivity Year referred to corrosion as "Negative Productivity".

He said: "The universal introduction of smokeless zones should certainly do a lot towards the reduction of corrosion and I hope we may eventually rival the atmosphere around the Delhi Pillar which has been standing close on 1700 years as an example of pure iron lasting for a very long time in a pure atmosphere without showing signs of corrosion.

"In London due to air pollution the amount of soot which still falls is 100,000 tons and the SO_2 250,000 tons in every year.

"This is also a problem worth tackling and we must support the efforts of those who, striving to attain clean air for health reasons, are unknowingly helping us in our fight against corrosion".

(*We are glad to quote Mr. Shaw's helpful remarks, but would query the word "unknowingly" in the last sentence. Both the corrosion of metal and the erosion of stone have long been included in the economic case for clean air.—Ed.*)

Sulphur Removal at Belfast

The new BP refinery now under construction on the Belfast Harbour Estate is to include in its equipment a sulphur removal and recovery unit which will play an important part in preventing atmospheric pollution from refinery gases. The contract has been awarded to Parsons Powergas. BP Refinery (Northern Ireland) Ltd. has been in consultation with the Ministry of Health and Local Government, the Ministry of Commerce and the Belfast Harbour Commissioners who have all given their approval and support. Hydrotreating and Hydrofining, in which, by the use of a catalyst, hydrogen removes the sulphur in a gas stream leaving a pure product, will both be used in Belfast. The gas will then undergo further treatment in the sulphur removal and recovery unit, in which the sulphur will be extracted and sold for industrial use. It will be of high purity and will be delivered from the refinery in molten state by road tanker.

Converting to Electricity

The Electrical Development Association has issued an informative illustrated booklet "When your neighbourhood becomes a Smoke Control Area . . . " which explains conversion procedures and shows how electricity can be used by the installation of electric storage heater, and for cooking and hot water supply.

Vibrator Motor Helps in Clean Air Problem

Vibrator motors made by English Electric are now helping with the clean air problem. The first installation is at a cement works in North Kent.

At the Greenhithe works, Associated Portland Cement Manufacturers Limited use electric precipitators between the rotary kilns and the stack to trap the dust which would otherwise escape with the hot gases from the cement production process. An electro-mechanical method of vibration was used to keep the precipitator tubes themselves clear but the output was insufficient to dislodge the accumulated dust and the equipment also needed excessive maintenance.

An experiment was therefore tried with two ½ h.p. pendulum mounted vibrator motors. The pendulum mounting gives a directional thrust. One of the motors was mounted on the outside walls of the precipitator casing on rapper channels which are mechanically connected to six rows of tube banks. The other was mounted on the roof of the precipitator casing and was mechanically connected via an insulator to the electrode suspension frame. The ambient temperature in this area is about 50°C.

The motors, which operate at 2,900 r.p.m. and develop a centrifugal force output of up to 2,000 lb., were automatically switched on for 10 seconds every four minutes for twenty-four hours a day, seven days a week.

This experiment with two motors has been a success and 24 motors have now been ordered for the rest of the precipitators in the Greenhithe works. Twelve motors will be associated with each precipitator.

We have received the first copy of a useful magazine for the trade under the self-explanatory title "Housing Fitments Journal". Although concerned with all kinds of fitments a substantial part of the contents relate to heating systems and appliances. There is an article on clean air in relation to heating in the home, by Roy J. Sharp, the Society's Exhibition Officer. The magazine is published at 2s. 6d., monthly, by Hartshead Publication, Marlborough Street, Oldham, Lancs., who will be pleased to send a specimen copy to interested readers.

Thomas Potterton Ltd. announce reduction in the price to the public of the "Potterton" BOA series of oil-fired boilers for domestic and commercial applications. According to size, the reductions amount to £17, £22 and £26.

A MOBILE LABORATORY FOR FUEL OIL COMBUSTION INVESTIGATIONS IN INDUSTRY

by

*L. K. Rendle, B.Sc., A.M.Inst.F.**

THERE are many investigations associated with fuel oil firing which are capable of being carried out only on full-scale operational plant in industry. Although oil-burners, for example, can be tested in special testing furnaces set up for the purpose it is not possible to simulate exactly the conditions encountered under normal service conditions. For this reason it is necessary to transport measuring equipment to the chosen site, to install instruments, and to make the required measurements, which may involve chemical analyses, physical measurements and microscopic examinations. Many of the operations which are normally carried out in a laboratory are required to be completed on the site and a mobile laboratory is therefore necessary to form an extension to the existing facilities.

The BP Mobile Laboratory has now been operating for three and a half years and a large variety of investigations on many types of plant has been carried out in the U.K. and on the continent. A wide size range of plant has been convered from small shell-type boilers to very large water tube installations. While a small platform may be adequate for standing on to place a testing probe in some of the smaller packaged boilers, the same operation in a modern power station may involve travelling 60-80 ft. in a lift to reach the top of the boiler. Apart from steam raising boilers measurements have been taken on furnaces, glass melting tanks, kilns, ovens, driers, gasifiers and chimneys of various types and sizes.

The investigations undertaken by the Mobile Laboratory, usually at the request of fuel oil users, can be divided into two main categories:

(*a*) *General Combustion Conditions*

The work under this heading includes the assessment of burners, boilers and ancillary equipment. The determination of the solids burden of the exit gases forms an important part of the work, and is linked with improvements in efficiency obtained by operating at the optimum excess air level. Information is given to plant engineers and operators which enables them to operate their installations with maximum efficiency and minimum pollution. The flue gases are also analysed for potentially harmful constituents, when required, and determinations of sulphur dioxide, sulphur trioxide and carbon monoxide can be made. Carbon dioxide and oxygen contents of the flue gases are carried out as routine. Sulphur dioxide can also be determined in the atmosphere at a distance from the source and useful information can thus be obtained on the relative effects of various sources on the general ground level concentration.

(*b*) *Corrosion by Flue Gases*

Corrosion can occur on boiler or heat exchanger surfaces and in chimney stacks when fuels containing

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The Mobile Combustion Laboratory

sulphur are burnt. The sulphur is oxidized to sulphur dioxide on combustion, and a small proportion of this is further oxidized to sulphur trioxide, which can condense out with water vapour to form corrosive sulphuric acid if temperature conditions favour its formation. The surface temperature at which acid will begin to condense out, or the acid dew-point, can be quickly measured by an electrical conductivity dew-point meter and the possible severity of the corrosion or potential corrosivity of the flue gases can be determined by using a temperature-controlled corrosion probe. From a knowledge of the acid dew-point which determines the temperature range over which corrosion can occur, and of the potential corrosivity, which determines the severity, recommendations can be made to enable the user to minimize or eliminate the corrosion caused by acid condensation.

Vehicle

A vehicle which is to be used as a Mobile Combustion Laboratory must have adequate carrying capacity for some rather heavy and bulky equipment, including an electrically driven air compressor, sufficient personnel carrying capacity for at least three, and enough head space over the whole of the floor area for staff of average height. It was found that these requirements were not easy to meet and that the field of choice was rather narrow. Eventually a motorized caravan was chosen and has proved to be very satisfactory for the purpose. Care has to be taken, however, that the vehicle is not overloaded, as there is a great temptation to take all the equipment available (the kitchen sink is not required—one is permanently installed in the van) on each and every expedition. Some modifications were made to the internal fittings, and extra shelving was incorporated instead of one of the two bench seats. A mains water tank is fitted and is connected to a small lift pump over the sink. For distilled water a polythene container was installed in the upper part of one of the corner cupboards. Two horizontal lockers above the side windows were modified to accommodate all the necessary sampling probes. Other modifications were mainly concerned with providing suitable anchorage points so that the equipment was firmly located and could not be damaged during transportation.

Techniques and Equipment Used

The location of some of the equipment normally carried is shown in Figure 1. For determining the solids burden of flue gases from industrial plant a method is used which employs a silica wool filter. The flue gas is drawn through an electrically heated probe fitted with a sharp-edged sampling nozzle, the size of which is chosen so that the gas velocity in the nozzle is the same as that of the gas in the duct. In this way a fair sample of the solids suspended in the gas stream is obtained. The electrical heating on the probe prevents any condensation of acid or water which would cause the suspended solids to adhere to the tube walls. The gas and solids are then drawn through a glass filter packed with fine silica wool, which retains the solids. The clean gas which emerges from the filter is cooled and metered. By accurately weighing the filter before and after sampling periods of a half to one hour, the solids burden corresponding to a measured volume of gas is obtained. The weighings are carried out on a fully transportable chemical balance which is capable of weighing to 0·1 mg.

An electrically operated smokemeter is used for quick assessments of combustion conditions, and is very useful when adjusting burners to operate at their optimum conditions, with minimum smoke production and minimum excess air. The excess air is readily calculated from the carbon dioxide content of the flue gas which can be quickly measured by a "Fyrite"* apparatus or more accurately by an Orsat apparatus.

The acid dew-point of flue gases is measured by an electrical conductivity dew-point meter. This instrument measures the temperature at which acid films just condense on an air-cooled element consisting of two platinum electrodes sealed into a

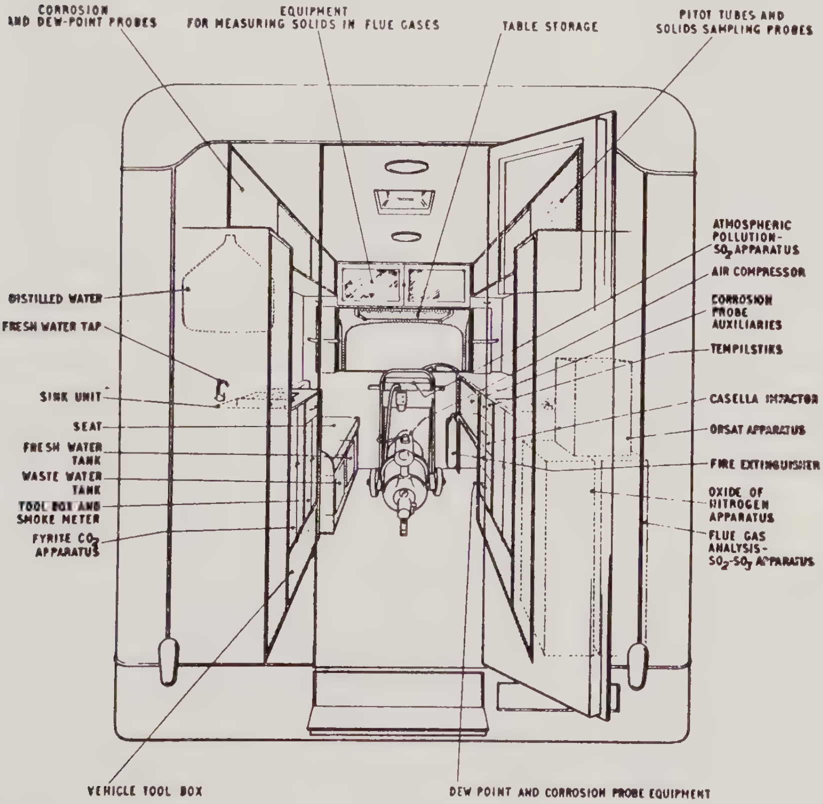
CORROSION AND DEW-POINT PROBES
EQUIPMENT FOR MEASURING SOLIDS IN FLUE GASES
TABLE STORAGE
PITOT TUBES AND SOLIDS SAMPLING PROBES
DISTILLED WATER
FRESH WATER TAP
SINK UNIT
SEAT
FRESH WATER TANK
WASTE WATER TANK
TOOL BOX AND SMOKE METER
FYRITE CO_2 APPARATUS
ATMOSPHERIC POLLUTION-SO_2 APPARATUS
AIR COMPRESSOR
CORROSION PROBE AUXILIARIES
TEMPILSTIKS
CASELLA IMPACTOR
ORSAT APPARATUS
FIRE EXTINGUISHER
OXIDE OF NITROGEN APPARATUS
FLUE GAS ANALYSIS-SO_2-SO_3 APPARATUS
VEHICLE TOOL BOX
DEW POINT AND CORROSION PROBE EQUIPMENT

Figure 1. *Showing the location of some of the equipment*

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* Made under licence in U.K. by Shandon Scientific Co. Ltd.

At work in the Mobile Laboratory

glass surface. A compressor is carried to provide compressed air when none is available at the installation on test.

Air-cooled corrosion probes and temperature indicators and controllers care carried to determine the potential corrosivity of flue gases. Several determinations of the corrosion experienced by a steel probe exposed to the flue gases are made when the surface is controlled at various temperatures below the acid dew-point. After each test period the corrosion products formed on the probe by the corrosive action of condensed sulphuric acid are washed from the surface and the soluble iron contents of the solutions are determined by a colorimetric technique.

Gas velocities are measured by pitot tubes, using an electric micromanometer, and air velocities are measured by either pitot tube or anemometer, depending on the sampling position and the range required. Shielded thermo-couples used in conjunction with portable millivoltmeters of suitable ranges are used to measure gas temperatures. Surface temperatures are measured by surface thermocouples or by wax pencils of known melting point ("Tempilstiks").†

Gas analysis equipment of various types is carried as required, but for more complicated analyses samples are taken for subsequent analysis by chromatographic or spectrographic techniques at base.

A binocular microscope, which can be illuminated by either transmitted or reflected light, is used to examine deposits and surfaces. Valuable clues to the causes of poor combustion can often be obtained by a microscopic examination of the gas-borne solids.

Examples of the Use of the Mobile Laboratory

From many investigations carried out, the following have been selected as having particular interest for the

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† Made in U.S.A. by Tempil Corporation, New York.

National Society for Clean Air.

1. An investigation was carried out at a large modern power station on two types of oil-fired water tube boilers which normally operated at about five per cent excess air. The effects of varying the excess air and the oil preheat temperature on solids production, sulphur trioxide and oxides of nitrogen concentration were studied.

2. Measurements were made on the waste gases from a tunnel kiln producing bricks and from a clay drier, to determine the corrosivity and the cause of attack on crops in the surrounding fields. A high concentration of sulphur trioxide was found but analyses indicated that the main cause of the damage to vegetation was hydrogen fluoride which was formed from the clay during firing.

3. A plant producing carbon dioxide by absorption from flue gases, made by shell-type boilers with special burners, suffered from excess carbon formation, which caused blockage in the absorbers and severe water pollution in the canal into which the waste was discharged. Measurements indicated that the tertiary air mixing was at fault. A modification of the air inlet system enabled the plant to operate at a high carbon dioxide level without excessive solids production, and the blockage and water pollution problems were cured.

4. A small packaged boiler was found to produce a considerably higher solids burden than is desirable in such equipment, although this was not obvious from visual observation. By making various modifications to the burner the solids burden of the flue gases was reduced to the normal low level associated with oil-firing.

Acknowledgement

The author wishes to thank the Chairman and Directors of the British Petroleum Company Limited, for permission to publish this paper.

IN PARLIAMENT

Question on Diesel Fumes

In the House of Commons on July 31, **Mr. Dudley Smith** asked the Minister of Transport what further progress has been made by his Department on research into the problem of diesel fumes from heavy lorries and other vehicles; if an effective smoke measurement meter can yet be brought into operation; and if he will make a statement.

Mr. Galbraith: There is no immediate prospect of a meter being developed which could be used from the roadside to make useful observations of smoke emitted by moving vehicles. There are, however, meters which work by attachment to the exhaust pipe of the vehicle to be tested; the possibility of using them as a means of enforcing a statutory standard of smoke emission on roads is being investigated.

The real remedy to the problem of diesel exhaust fumes lies in correct maintenance and operation of engines.

The Alkali Inspectorate

On June 18, Mr. Slater asked the Minister of Housing and Local Government if the strength of the Alkali Inspectorate was now up to establishment; and to what extent the regional offices were fully manned.

The joint Parliamentary Secretary to the Ministry, Mr. F. V. Corfield, replying, said: "The district offices are adequately manned at present, but the effect of the recent Alkali Works Order is being closely watched. If and when necessary two additional inspectors will be recruited to bring the strength up to establishment."

The trade journal *Heating, Air Conditioning and Refrigeration Weekly*, reviewing the Society's Clean Air Year Book, 1963-64, reproduced the photograph on the front cover, which it described as "a grimly symbolic picture".

A U.S. View of the Sulphur Problem

From a Paper by Vernon A. MacKenzie

We reproduce parts of a paper on "The Power Industry and Air Pollution", read to the annual meeting of the Association of Edison Illuminating Companies, on November 28, 1962, by Mr. MacKenzie, Chief of the Division of Air Pollution, Public Health Service, U.S. Department of Health, Education and Welfare. The paper discussed also power plant emissions of particulate matter and oxides of nitrogen, but it is the sections on sulphur that are of especial interest, both in their references to American views on its physiological effects and on its control. A reprint of the complete paper is published by the Department, Washington, D.C.

The Sulphur Dioxide Problem

Of all the air pollutant emissions from thermal electric power generating plants, sulphur dioxide is probably of greatest current importance. In large power plants, practically all of the 1 to 6 per cent sulphur commonly found in fuel oils and coals used in this country is oxidized and discharged in the stack gases. It is emitted primarily as sulphur dioxide gas although small amounts of sulphur trioxide are also present.

Sulphur dioxide is of concern as an air pollutant principally because of its irritating, and tissue and vegetation damaging, properties. It appears to have no toxic systemic effects after absorption, its action being limited to the irritation and damage to the surfaces where it is absorbed. Because of its relatively high solubility in water, most of any inhaled sulphur dioxide gas may be expected to exert action only on the upper portion of the respiratory tract. In industrial exposures, SO_2 gas has not been considered a highly toxic gas; thus the currently accepted maximum allowable concentration for industry operations is 5 p.p.m. Nevertheless, SO_2 has long been under suspicion of being capable of producing adverse health effects in community exposures at much *lower* concentrations, both in acute situations such as in Donora, Pennsylvania, and in London and in long-term exposures. In the past several years, research studies have produced information which would confirm such suspicion and provide explanation of the probable mechanisms involved.

These new research data are of several kinds. It has long been known that sulphur *trioxide*, or its hydrated form, sulphuric acid, when inhaled in appropriate particle sizes, can penetrate deep into the lung and exert much greater damaging effect on the deep, delicate, and physiologically more important tissues *there*, than can sulphur dioxide containing the same amount of sulphur. Sulphur dioxide gas, in dilute concentrations in pure air, oxidizes to the SO_3 form at very slow rate. This oxidation rate, however, can be increased greatly by catalytic action of certain metallic salts commonly present in the ash from fuels and in the suspended particulates in community atmospheres. Such catalytic oxidation of SO_2 has been demonstrated in the laboratory and also in the plumes of power plant stack gases. The rate of oxidation of SO_2 in such plumes appears to be related to ash composition and to atmospheric humidity.

Laboratory studies have also shown

that the physiologic effects of SO_2 are greatly enhanced by the simultaneous presence in the inhaled air of certain particles of size appropriate to deep penetration of the lung. The presumption has been that the gas is absorbed on the particles and carried by them deep into the lung. This synergistic effect has been observed both with solid particles which are otherwise physiologically inert and with particles of sulphuric acid mist. When combined with sulphuric acid mist, sulphur dioxide appears to exert approximately the same severity of physiologic effect as if all the sulphur were present in the higher oxidative state.

These research data have led us in the Public Health Service to the present belief that allowable concentrations of SO_2 in community atmospheres should be based on the estimated physiologic effect of equivalent amounts of sulphur in the form of sulphuric acid mist. Application of this to community air pollution control practices will lead to a need for more stringent controls over SO_2 emissions than has been the case in the past. The logic of this conclusion is reinforced by the results of recent epidemiologic studies, as at Nashville where asthmatics showed increased reactions at very low levels of sulphur-oxides contamination, and in the report by Dohan of the excellent correlation between respiratory infection rates and average sulphate pollution among RCA workers in several cities.

Control of Oxides of Sulphur

For minimizing the effects of sulphur oxides pollution from power plants, the most commonly used procedure has been the construction of high stacks—increasingly higher as plant size has increased. There is considerable reason to believe that a point of diminishing returns is being reached in this regard, particularly in level terrain and as related to the 1,000 megawatt and larger power stations.

Dispersion of effluent gases in the atmosphere from large generating plants must, of course, be considered on an individual basis with due attention to local topography and meteorology. For plants in the 1,000 to 5,000 megawatt range, estimates of ground level concentrations of contaminant gases downwind are subject to greater uncertainty than with smaller plants for which actual dispersion patterns have been measured. Nevertheless, it is clear that, under favourable meteorological conditions, the plumes from such large plants will rise far in the air and will not return to ground levels for long distances. Potential adverse conditions for build-up of contaminant stack gases are of three types: (1) high winds which cause looping of the plume back down to ground levels within relatively short distances, (2) fumigations associated primarily with the breakup of diurnal temperature inversions in the atmosphere, and (3) the broad limitation on gaseous dilution associated with the longer-term limits of total mixing depths in the atmosphere.

For the first of these, quite high velocity winds would be required to cause looping of plumes from large generating plants—estimated at approximately 25 m.p.h. for a 1,000 megawatt single-stack plant and 40 m.p.h. at a 5,000 megawatt plant. For a stack height of 800 feet, and with coal of 3 per cent sulphur content, our meteorologists estimate for such conditions a maximum half-hour ground level concentration of SO_2 of about 0·30 p.p.m. for both plants.

With such large plants, the second meteorological condition of concern, inversion breakup in the atmosphere, is likely to produce somewhat higher ground-level concentrations of stack gas contaminants. Under these conditions, and for an 800-foot stack and 3 per cent sulphur coal, estimates would indicate a maximum half-hour concentration of 1·7 and 2·1 p.p.m. SO_2 for the 1,000 and 5,000 megawatt plants, respectively. Increase of stack height to 1,000 feet might reduce these concentrations by 0·3 to 0·4 p.p.m.

While inversion breakup conditions

applicable to the conditions noted above occur only infrequently in many areas, the total mixing capacity of the atmosphere over broad geographic regions has distinct limitations which persist for long periods of time. Staff members of our Division have made estimates of the maximum mixing depth in the atmosphere, e.g., the depth above the ground surface in which convective currents are active, for the 44 radiosonde stations in the United States at which temperature records at the ground surface and at various heights above it are available. Generally, in January, the maximum atmospheric mixing depths are from about 650 to 2,000 feet throughout the United States. In July, they reach over 5,000 feet above the Appalachians and over 13,000 feet above the Rockies, but along the cool Pacific and New England Coasts, the layer is considerably shallower. Under these circumstances, it is the quantity of pollutant discharge which directly determines the ground-level pollutant concentration downwind after mixing in the convective layer; tall stacks can contribute little in dealing with this situation. With larger power plants, more and more air pollution problems can be expected to occur under such relatively common meteorological conditions. Thus, with a mixing layer of 2,000 feet depth, an average wind speed of 10 m.p.h. in the layer, and with coal of 3 per cent sulphur, ground level concentrations of about 0·33 p.p.m. might be expected from a 1,000 megawatt plant and about 0·8 p.p.m. from a plant of 5,000 megawatt size.

The Future

The conclusion to be drawn from these figures is that, in the future, the sulphur oxides pollution problem at power plants will have to be dealt with by using more effective measures than tall stacks, particularly for the larger size plants now being projected. The estimated concentrations of sulphur oxides which I have cited could be expected to produce extensive damage to vegetation, and, based on present data, certainly to produce adverse health effects on many people so exposed. Location of large thermal generating plants burning sulphur-containing fuels at considerable distances from urban communities would, of course, decrease but probably not eliminate the human exposure.

The future solution to the sulphur oxides pollution problem undoubtedly will come through the development of appropriate methods for preventing their emission. For power plants, this means removing either the sulphur from the fuel or the sulphur oxides from the combustion gases. Some, although not enough, attention has been given to studies of both of these approaches. Natural gas, as delivered to most customers, is now effectively desulphurized. There is real need for application of similarly effective desulphurizing processes to coal and fuel oil.

Sulphur is already being removed from most petroleum products. Extension of this available technology to desulphurization of residual fuel oils—or to crude oil so that all refinery products would be essentially sulphur-free is stated to be "too expensive". The "too expensive" label quite apparently is applied in relation to the competitive position of residual fuel oil and not to comparisons of the ultimate costs to the public of removing the sulphur versus leaving it in and suffering the air pollution damages. To date, definitive economic studies of the latter type have not been made.

With respect to coal, the technical situation pertaining to sulphur removal appears to be somewhat more difficult. In this case, some of the sulphur is chemically combined with the coal, and the remainder, averaging perhaps 50 per cent, occurs as entrained particles of iron pyrite. Much of the entrained sulphur can be removed by mechanical and washing processes. The current practice at large power plants of burning coal in finely divided form should make more practical the separation of both these forms of sulphur from the coal. However, comparatively little research attention has been given to this problem, probably because of inadequate incentives to do so.

For removal of sulphur oxides from combustion gases, a wide variety of procedures have been given some trial —including washing with water or chemical solutions, absorption of the gases on activated carbon or recirculated fly-ash, oxidation of the sulphur dioxide with vanadium catalyst, and injection of such neutralizing additives as limestone, gaseous ammonia, or dolomite ahead of the electrostatic precipitators. Some of these have shown reasonable effectiveness; all of them involve considerable expense; some require further evaluation. Two current avenues of such investigation deserve, perhaps, special mention—the studies by the U.S. Bureau of Mines and those by the Warren Spring Laboratory in England. Both of these are concerned with the absorption of gaseous sulphur-oxides on solids which can be regenerated.

The Bureau of Mines, with financial support from the Public Health Service, has conducted screening tests on a variety of possible absorbents for use in fixed beds or counter-current towers in which the solids fall through the flue gases. More extensive tests are being made on two absorbents—an alkalized alumina and a manganese oxide. Similarly, at the Warren Spring Laboratory, pilot plant tests are underway on the Reinluft Process which uses falling pellets of an activated carbon in a reaction tower for removal of the up-flowing sulphur oxide gases. Reliable estimates of costs of application of these processes cannot be made until more data are available from pilot plant tests.

Personal

Warren Spring—Dr. Charles Hall has been appointed Director of DSIR's Warren Spring Laboratory, and Mr. S. H. Clarke, the retiring Director, will take up a post at DSIR headquarters, with responsibility for supervising the careers of scientific staff in the Department. Both appointments take effect in January 1964. Dr. Hall, who is 56, was appointed Deputy Director of the newly-formed Warren Spring Laboratory in 1959. He has been in charge of the Fuel Research Station's work on the Fischer-Tropsch process, and is acknowledged as this country's expert on the process.

National Coal Board—Dr. Idris Jones, C.B.E., Director-General of Research and Development (Coal Processing and Combustion) and Head of the Board's Scientific Department since 1947, will be retiring at the end of September. Dr. J. Bronowski, Director-General of the Process Development Department will also be leaving to take up an appointment in the U.S.A. with the Salk Institute at about the end of the year.

Hydrogen Sulphide in London Smog

In a letter to *Nature*, August 3, J. T. Minster of the Post Office Engineering Research Station, gives details of measurements of hydrogen sulphide in the atmosphere at the Post Office Research Station, London, N.W.2, during the December fog last year. During December 6, when the fog was thick the H_2S content of the atmosphere ranged from five to 33 parts per thousand million. Observations made during the past 2½ years show that this gas is present in concentrations that range from 0·1 or less p.p.t.m. in clear, fresh summer weather; 0·1 to 0·5 in average summer conditions; 0·1 to one in average winter conditions; and one to five in winter fog and with a drift of air from the east.

The City of Manchester Health report for 1962 records that there are now 56,592 premises in the city subject to smokeless zone or smoke control area orders, either operative or waiting confirmation. This represents about 23 per cent of the total number to be dealt with, compared with a national average in the "black areas" of 17·3 per cent.

The Removal of Sulphur Dioxide from Flue Gas

by L. E. Reed

Air Pollution Division, Warren Spring Laboratory

SMOKE and sulphur dioxide have been considered for many years the major pollutants arising from the combustion of fuel. The reduction of industrial smoke is being achieved by improved combustion methods, and the use of smokeless fuel by the householder is reducing domestic smoke. Unfortunately pollution by sulphur dioxide is not so easily reduced, and any decision as to what are acceptable levels of such pollution must be considered therefore in relation to medical, technical and economic aspects.

The medical effects of sulphur dioxide in high concentrations are well known and it is generally accepted that the average person can work without undue discomfort for a period of eight hours in an atmosphere containing 5 p.p.m. of sulphur dioxide.[1] Little is known, however, about the medical effects of long-term exposure to low concentrations. The Russians have adopted a maximum allowable 24-hour concentration of 5·3[2]pphm—a level which is exceeded on some 50 per cent of the days of the year in industrial regions in this country where sulphur oxide emissions are large. The Germans have recommended a 24-hour limit of 9·8[3]pphm which, although more realistic, would prove difficult to achieve at present. No limits of this kind are officially recognized in this country, but in the absence of any conclusive evidence that sulphur dioxide is harmless at low concentrations it would be prudent to assume that ground-level values should be reduced to the lowest practicable level.

The possible dangers of pollution by sulphur dioxide were recognized as long ago as 1927, when, in consenting to the construction of Battersea Power Station, the Electricity Commissioners imposed the condition that the evolution of sulphur dioxide should be prevented as far as reasonably practicable. This led to the Battersea process of flue-gas scrubbing which is now also practised at Bankside Power Station. In this system the flue gas is washed with large volumes of Thames water. The water itself supplies most of the alkalinity necessary to neutralize the sulphur oxides removed from the flue gas, but some additional alkali is added in the form of powdered chalk. The calcium sulphate produced is returned to the river in solution in the water. This limits the amount of gas that can be washed by this process, because the river can never be allowed to become saturated with calcium sulphate, which would separate out on the equipment of other users of river water. The cost of operating this process has been put at 8s. to 10s. per ton of coal burned, but would nowadays probably be nearer £1 for a new plant.

To overcome the limitations imposed by discharging the effluent into rivers the Howden—I.C.I. process was developed. In this method the flue gas was scrubbed by a liquor which was kept alkaline by the addition of lime. The calcium sulphate formed was allowed to crystallize out and was removed. Although technically quite successful, the process was uneconomic and was stated[4] to cost some 17s. per ton of coal burned (1953 figure); it is probably safe to take the present-day cost as about twice that of the C.E.G.B.—Battersea process.

While both these processes were successful in removing the sulphur oxides from the gas, no useful product was recovered, and it was realized that it would be economically advantageous if a process with a saleable end-product could be devised. The Fulham—Simon Carves[5] process was one such. In this, the flue gas is scrubbed by a solution of ammonium salts which effectively removes the oxides of sulphur. The liquor is subsequently treated to produce ammonium sulphate and sulphur. The technical success of this process on a large scale was demonstrated by tests at North Wilford Power Station, with plant treating flue gas at a rate of 56,000 ft^3/min. The process was intended to use ammonia liquor derived from gas works and coke-oven plant, and this source of ammonia is obviously limited. Synthetic ammonia can be used to supplement by-product ammonia but it is difficult to estimate the cost at which it could be supplied in large quantities for gas scrubbing. Only about one million tons of ammonium sulphate are produced annually in this country, and the whole of this could be produced from the flue gas resulting from the combustion of 17 million tons of coal containing 1·6 per cent sulphur. In fact, treatment of the flue gas at three or four of the proposed ultra-large power stations would provide all the ammonium sulphate required in this country. The application of the ammonia process to large power stations must therefore be considered on a national scale, taking into account all the problems of supply and demand at that level, including in particular the existing facilities for producing sulphate by other processes, as well as the economic factors in the narrower sense of the term.

The present position is that, unless it is shown that it is *imperative* to prevent the emission of sulphur dioxide then dispersion of the flue gas from high chimneys gives the cheapest and most reasonable practicable solution. It has been argued that even with the highest chimneys these large sources of sulphur dioxide could, under certain rare meteorological conditions, give rise to excessive ground-level concentrations. If this were found to be the case in any particular instance it would be necessary to modify the operation of the power station or provide it with a fuel of low sulphur content.

With some smaller plants the occasion may arise where adequate dispersion of the flue gas is impossible and gas treatment may be the only alternative. The Fulham—Simon Carves process is suited technically for such demands for the following reasons:

i) It is the only non-effluent process which is fully developed.

ii) For any individual project, reasonably accurate costing can be done once the supply of suitable ammonia to the site has been investigated.

iii) It is not difficult to conceive of circumstances under which the cost of the process would be considered acceptable.

All wet processes, however, suffer from the disadvantage that the flue gas is cooled and saturated with water. The plume from the chimney therefore has little buoyancy and dispersion is poor. A dry, regenerative process which does not cool the flue gas appreciably would be preferable, and one such process, the Reinluft Process, is being investigated at Warren Spring Laboratory. Final results, however, are not expected for some time.

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NCB REPORTS A PROFIT

Productivity rises by nine per cent.

National Coal Board. Report and Accounts for 1962. H.M.S.O., Vol. 1 (Report), 3s. 6d.; Vol. 2 (Accounts), 13s. 0d. net.

FOR the first time for six years the Board made a profit on the year's operations. Production increased by nearly 8 per cent. Wider and more efficient use of machines resulted in 20,000 fewer men producing eight million more tons of coal. The Board made an operating profit of £45·4 million before charging interest, an increase of £16·8 million over 1961. Interest charges amounted to £44 million leaving a surplus of £1·4. million compared with a deficit of £15 million in 1961.

The production of saleable coal amounted to 197·44 million tons including 7·30 million tons of opencast, and 2·55 million tons from licensed mines. Inland consumption of coal amounted to 191·2 million tons, including power stations 60·4 million, gasworks 22·1 million, coke ovens 23·5 million, industry 27·4 million, domestic consumers 28·6 million, miners' coal and colliery consumption 8·9 million, railways 6·2 million and miscellaneous 14·0 million tons.

The average cost of saleable deep-mined coal was 87s. 2d. a ton and the average price realized 91s. 9d. Average cost of opencast production was 68s. 2d. a ton, and an operating profit of £5·5 million resulted from opencast production.

Coking Plants

Owing to reduced activity in the steel industry and to increasing self sufficiency with the development of integrated steelworks, the Board was faced with a fall in demand for coke for blast furnaces and foundries and was obliged to curtail production. As a result nine coking plants were closed. To meet commitments to the Gas Boards, the production of gas from other plants was increased and oven gas formerly used for underfiring was replaced by methane drained from collieries or producer gas from coke-fired producers. The production of smokeless fuel "Sunbrite" was increased and its use in smoke control areas is expected to grow. "Phurnacite" manufactured at Aberaman continues in strong demand. As a result of reduced coke production by-products also fell somewhat. 52 thousand million cubic feet of coke-oven gas were disposed of, and there were produced 307 thousand tons of tar, 19 million gallons of benzole, 51 thousand tons of sulphate of ammonia.

Productivity

Coal face productivity per man-shift varied from 136·3 cwt. in the East Midland Division to 60·0 cwt. in the South Western Division and over all average 91 cwt. compared with 83·5 cwt. in 1961, an increase of 9 per cent, compared with an annual increase of 4 per cent for the previous five years. During the year 58·8 per cent of the colliery output was obtained by mechanized methods compared with 47·7 per cent for the previous year. Production continues to be concentrated at new and reconstructed collieries while at the end of the year 53 fewer collieries were producing than at the end of 1961.

Research continues in the development of new techniques for mining thinner seams of three feet thickness from which 35 million tons of the output is obtained, in methods for remote electronic control of power-loading machines and self-advancing supports, the automatic handling of cables feeding power loaders, hydraulically driven loaders and in other directions.

Capital Expenditure

Capital expenditure during the year amounted to £86·2 million a reduction of £7·3 million reflecting the progress that has been made towards the reconstruction of the industry. £38·6 million was spent on major schemes, £39·6 million on other colliery expenditure £6·8 million on coke ovens, and £1·2 million on housing for mineworkers. During the year 206 major schemes had been completed while 98 more were in progress at the end of the year Replacement of older coal preparation plants continues and 25 new plants were brought into operation.

Combustion research has continued in co-operation with manufacturers of domestic and small industrial solid fuel appliances in central-heating systems based on the open fire and employing small-bore circulation, in openable stoves for burning smokeless fuels in some cases providing hot water and some central heating, in central heating boilers with refuelling and ash removal reduced to a minimum in appliances to burn bituminous coal smokelessly, and pulverized fuel-firing systems for medium-sized shell boilers.

At the blast furnaces of Stanton and Staveley Ltd., experiments have continued in the injection of pulverized coal into the tuyeres of a blast furnace whereby the consumption of coke is reduced.

Marketing

The Board continues activities with a view to maintaining a market for 200 million tons a year. Its technical and advisory service is available to industry and Local Authorities and during the year made some 15,000 reports. In the domestic market where many consumers have limited storage, frequent deliveries are essential. The approved Coal Merchants Scheme which establishes minimum services for coal retailers, came into operation on May 1, 1962 and requires coal merchants to carry adequate stocks to give priority to orders notified as urgent on account of sickness, old age or infirmity, to investigate complaints promptly and to give technical advice. 7,041 merchants, representing 85 per cent of sales, had joined the scheme and of these 844 held the technical diploma of the Coal Utilization Council.

The number of groups of house coal has been reduced from seven to five and the difference in price standardized at 10s. per ton.

Processing Research

Research has continued into the production of smokeless fuel for the domestic market. A large scale consumer trial was undertaken of the extruded hexagonal briquettes produced at the pilot plant at Birch Coppice. Of the 16,000 consumers to whom samples were sent, nearly 90 per cent considered the briquettes were better than or as good as any premium fuel they had used.

Work has continued on a plant for the production in the South Western Division of a high quality smokeless fuel by mild heat treatment of pitch-bound briquettes made from anthracite duff and low volatile coals.

The Board operated 62 brick, salt-glazed pipe and refractory works which produced 492 million bricks and 27 thousand tons of pipe and refractory ware.

The Coal Industry Act 1962 altered the Board's financial year, which hitherto has ended on the Saturday nearest to 31 December, to the year ending on the last Saturday in March.
—*A.J.C.*

Queens Fined for Smoking

The two famous Cunarder "Queens", *Elizabeth* and *Mary*, were fined 100 dollars each recently in New York for smoke emission. "We can't discriminate between queens", said the judge in setting equal fines.

The steamship line pleaded guilty to the summonses. Lawyers explained that the ships were old and their boilers could not be reconditioned to give out less smoke, but that some way to cure the problem was being sought.

" Air Knows no Frontiers "

INTERNATIONAL SECTION

France

TECHNICAL ACTION COMMITTEE REPORT

We have received a handsomely produced publication, embellished with tables and graphs in colour, which describes (in French) the two years of work of the French Technical Action Committee against Atmospheric Pollution. This Committee was formed in 1960 by representatives of the entire French industry at the initiative of the French Institute of Fuel and Energy. The book is an interesting survey of the measures undertaken by the various industries in France in the fight against air pollution.

The first section deals with the definition of pollutants and their measurement which is of prime importance if thresholds of discomfort and noxiousness are to be specified for humans, plants and materials. Research on this subject proceeds in numerous countries, but the most recent international conferences have shown that many difficulties have to be overcome before standardized measurement equipment can be adopted in order to correlate the measurements made in various countries and to analyse statistically the effects of certain pollutants.

Among the studies made in France there was an important one made by Professor Raymond, who during 1959/1960 studied the existing correlation between mortality and air pollution curves. He concluded that a whole series of experiments remained to be done before an exact understanding was arrived at, of the repercussions on the health of the French people of the variations in atmospheric pollution and weather conditions.

France has as yet made no recommendations on maximum allowable concentrations of pollutants such as exist in Los Angeles or in Germany. Measurements taken in Paris in 1960 during February—usually the worst month—have shown concentrations of 0·12 p.p.m. of SO_2 (with a maximum of 0·60 p.p.m.) and 0·220 mg/m^3 of dust (with a maximum of 0·900 mg/m^3). These figures show an approximate 15 per cent reduction in both SO_2 and dust on the figures from the preceding three years. The reasons for this improvement, in spite of the increased number of fuel consumers, can be explained by the following:

(*a*) effort on the part of fuel suppliers, particularly of oil, the sulphur content of which has been lowered as much as is practicable at present;

(*b*) effort in modernizing domestic cooking and heating appliances;

(*c*) effort in educating the public and boiler operators;

(*d*) effort by industrialists in better fuel efficiency and installation of dust collecting equipment;

(*e*) effort by the Electricity of France, whose power stations emit less SO_2 and dust.

Colourful graphs show clearly the consumption of power in 1961 by various sectors such as domestic, industrial, transport, power stations etc. and the percentages of how the different fuels are distributed among them. Other tables show the estimated requirements in 1965 and 1975 and here it is interesting to note that on the domestic front the biggest increase is foreseen in the use of oil: from 22·9 per cent in 1960 to 53·5 per cent in 1975, whereas 69·4 per cent of solid fuel burnt in 1960 is expected to fall to 31·5 per cent in 1975.

As far as heating methods are concerned, it is very surprising to see that up to 1958, 71 per cent of the French households still used the solid fuel cooking range (with or without stove) as a means of heating.

The remaining chapters each give an account with statistics and graphs, of the action undertaken to minimize atmospheric pollution by the following French industries: solid fuel, liquid fuel, gas, distributors of liquid hydrocarbons, electricity, manufacturers of domestic heating appliances and those of industrial boilers, as well as by various official and industrial organizations.

Finally it is concluded that in two years the Committee has fulfilled its function as envisaged by its founders and which can be summed up as: the knowledge, the dissemination and the study of the best methods in fighting atmospheric pollution. The most important result of the Committee's work is considered to have been achieved on the psychological front, as its working groups have brought together the points of view (often conflicting) of so many different interests and have enabled to acquaint them all with the problems of each. Internationally, the Committee is keeping in touch with the various comparable European organizations and will participate in the 1963 Council of Europe at Strasbourg. It will also be represented at the forthcoming NSCA Conference at Scarborough

Conscious of having carried out the first part of its mission, the Committee wishes to continue its work and to give regular progress reports in the future.

U.S.A.

LEGAL AND ETHICAL PROBLEMS OF AIR POLLUTION RESEARCH

Although considerations of legal and ethical issues involved in air pollution research have not begun to be studied seriously in this country yet, they may well face scientists in the near future, as, (it is hoped) such research will grow in scope. It is therefore of considerable interest to note that the *American Archives of Environmental Health* (June 1963) have published four papers which were presented during one session of the Fifth California Air Pollution Medical Research Conference, December 4, 1961, in Los Angeles. This session was called "Legal and Ethical Problems of Human Exposures".

In "*Medicolegal Aspects of Air Pollution Research*" by Irving Ladimer, it is stated that one of the many problems facing air pollution scientists and control officials is the interrelation of medical, legal and ethical issues involved in clinical research, as the latter may include natural exposures and deliberate human experimentation. Certain clinical studies must be undertaken with the support of the entire community in order to achieve air pollution regulations based upon a realistic set of standards which in turn must rest on solid scientific research. Consequences of air pollution can be assessed in terms of health, happiness and economics. Although U.S. courts have been reluctant to decide, without scientific evidence, how far it is reasonable to go to prevent a person or industry from expelling alien substances into the air, they have recognized the importance of psychosomatic effects: "We may never be able to eliminate completely the emotional aspects of air pollution, but we do know that smoke, disagreeable odours, industrial soot, and smog have adverse effects on the psychological as well as the physical well-being of populations".

Stressing the importance of research on humans, the author considers that any legislations which authorizes investigation and medical research, should also include provisions for experimental human exposures and he quotes principles formulated by the California Department of Public Health for such studies. But in spite of these proposed standards, Californian scientists and engineers have not been able to proceed with certain clinical studies because of administrative and legal uncertainties. It is therefore suggested that there must be various legal and financial safeguards to protect both the investigator and his subject from any unforeseeable contingencies.

In "*Ethical Considerations in Air Pollution Research*" by Haskell J. Weinstein, the need is again recognized for human experimentation in air pollution problems. While the so-called "natural" or accidental exposures to pollutants, such as the Donora, Meuse Valley and London incidents have shown adverse and even fatal effects upon humans, effects on them of long exposures with minimal doses are not known. Such investigations should therefore be carried out in close co-operation between responsible government agencies, clinical investigators and their institutions. The subjects of the experiments must be carefully selected; they should be normal individuals and well informed as to the risks and hazards, potential and otherwise, for which they are volunteering. "It appears doubtful", says the author, "whether volunteers could sue for malpractice as a result of an untoward result, if the experiment was carried out under satisfactory conditions and with proper precautions and proper approbation. However, the volunteer could, of course, sue for malpractice under any circumstance if negligence of any sort in carrying out of the experiment could be proved". Following appropriate studies in normal subjects, it will be necessary to undertake similar experiments in patients with certain respiratory ailments. In spite of the increased potential risks here, there is justification for such experiments as many patients could be assisted in finding more suitable environments if any of the agents tested were demonstrated to have an adverse effect on their physical condition, provided these agents were present in significant amounts in their normal environment.

David W. Louisell in "*Legal Limits on Human Experimentation*" surveying the legal problems facing research work in the U.S. states that thought about experimentation, so far as the courts have expressed it, is largely a function of the problem of medical malpractice: "Has the physician departed impermissibly from recognized standards of medical practice?" In the author's opinion, fear of legal sanctions respecting a carefully performed experiment is academic when the following circumstances prevail: "1. The experiment enjoys the consensus of informed medical opinion as to its legitimacy, and is not in violation of statute; 2. the subject, a competent adult person, knowingly and voluntarily consents after full explanation; 3. there has been adequate preparation in animal experimentation". However if the law is not developing satisfactorily to meet actual needs, there are radical possibilities it will have to face: for instance an insurance policy which would guarantee a volunteer protection against the serious hazards, or for the authorities to assume by legislation financial responsibility for the victims of reasonable experimentation without regard to whether there was negligence.

Harold W. Kennedy, author of "*Legal Aspects of Human Exposures to Atmospheric Pollutants*" approaches the subject from the practical standpoint of the County Council of Los Angeles County, with experience in defending county employees being sued for damages alleged to result from the performance of their public duty. As regards medical experimentation on human beings, the objectives of the doctors and of lawyers are the same: "The primary responsibility is on the investigator, for it is he who decides how far to go in experimentation and what course it shall take. The attorney is called upon to aid the investigator, reassuring him where possible, and warning him where caution is necessary". Although it has now become obvious that the point has been reached at which air pollution control efforts require more information than can be provided without human experiments, these efforts need not await the final results of the studies. The author quotes numerous California court decisions where the legal view was that emissions of smoke, dust and fumes may be controlled without any proof of a hazard to health.

"It cannot be denied, however, that the major efforts in protecting people from the effects of air contamination will hereafter require more definite knowledge than we now posses. If, for example, it can be shown clearly what the relationship is between automobile exhaust products in the air and human health, then effective action can be taken. Depending upon the results, we in Los Angeles may decide to advise sick people to move away, or we may decide to spend millions of dollars on reforming motor fuels or even mass transit systems."

It is concluded that no progress is made without exposure of someone to legal liability. An excessive concern with this factor, however, can do nothing but stifle progress. If the matter of liability is understood, and is placed in proper perspective by the investigator, then his work can go forward and real progress can be made in air pollution research.

International Union
of Local Authorities

CONFERENCE AT DUSSELDORF

This conference of the I.U.L.A., in June 1962, was attended by 21 delegates from the national associations of local authorities of ten countries, with representatives also from WHO and the Council of Europe. Its work consisted largely of the examination of the replies to a questionnaire received from 18 countries and concluded with a series of recommendations addressed to local authorities.

A report has now been published by the Union (5, Paleisstraat, The Hague, Netherlands), for the greater part of which acknowledgements are made to the rapporteur of the meeting, Mr. Philip B. Dingle, Town Clerk of Manchester.

The report is of value largely because of the tabulated summary of the questionnaire replies, mainly concerned with national legislation and controls. These replies were from Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Italy, Netherlands, Norway, Sweden, Turkey, U.K. and Yugoslavia. The reply from Iceland was "no problem", while replies from Canada and the U.S.A. also received are not included in the report. The replies contain many interesting points of detail but are so varied that it is difficult to summarize them. The views and conclusion of the conference may best be reported by quoting in full the comprehensive resolution with which it concluded.

This recommends:

1. That local authorities should cultivate an awareness of the need for clean air and an appreciation of the dangers of a polluted atmosphere for human health as part of their health education programme, in addition to making it widely known that air pollution is a waste of

national resources in that it causes great losses of fuel and does damage to buildings, animals and plants;

2. That local authorities should assist in the attainment of this goal by, among other things, promoting the formation of official committees or voluntary clean air societies, by appointing representatives to such bodies, and by supporting them financially;

3. That local authorities should collaborate or, where necessary, take the initiative, in taking qualitative and quantitative measurements of the level of pollution of the atmosphere, both particulate and gaseous;

4. That local authorities should publish the results of such measurements and have articles contributed to the press, emphasizing the significance of these results by comparing them with acceptable standards;

5. That local authorities should press for legislation which would:

(*a*) Define by reference to precise standards what should be allowed by way of emission of visible and invisible pollutants of the atmosphere, and

(*b*) Enable local authorities to make regulations and take other necessary measures for their areas or parts of their areas;

6. That, pending the enactment of satisfactory legislation, the palliatives of effecting some control over air pollution by "prior approval" powers, building regulations, public nuisance laws and the expedient of using planning powers to site industry down wind and even away from the cities and towns, will no doubt have to continue;

7. That local authorities should be prepared to collaborate through joint committees which might be executive or advisory in regions where air contamination problems can only be solved by common action of several local authorities;

8. That local authorities should play their part at the national level by supporting the formation of a National Clean Air Council to advise the Government on problems of air pollution and by encouraging associations of local authorities to accept representation on that Council; also the local authorities should, either through their associations or through the National Council, consult with the Minister concerned as often as may be appropriate;

9. That certainly the larger authorities should establish an adequate service, headed by an expert of academic standard, to handle all problems of air pollution in their area;

10. That local authorities should be constantly alert to ensure that there is a degree of co-ordination in research projects and other activities throughout Europe and even throughout a wider area and to ensure that the information be pooled and published. In this respect the initiative taken by the Council of Europe to examine these questions at a future conference was welcomed.

"Coalite" Progress

Coalite and Chemical Products, Ltd., in its annual report for the year ended March 31, 1963, shows another year of records—in production, sales and profit. A total dividend of 14 per cent has been made. Capital expenditure during the year was over £1 million, greater than in any previous year in the history of the company. All the pre-1939 retorts at both Bolsover and Askern have now been modernized and good progress is being made with a major scheme of expansion at Askern. New batteries of retorts coming into service will increase the output of the Group as a whole by more than 20 per cent. Further batteries are being planned and other schemes are under consideration.

Gas Conference

The eighth Sales and Service conference organized by the Gas Council will be held at Brighton on October 29, 30 and 31. The conference will be attended by about 700 delegates, mainly from Area Gas Boards, and the Minister of Power, the Rt. Hon. Richard Wood, M.P., will speak at the opening session.

Head Wrightson Iron and Steel Works Engineering Ltd. (Teesdale Iron Works, Stockton-on-Tees), have published two informative illustrated brochures on electrostatic precipitation, and one on "Clean Air: How to beat air pollution", which concisely describes the different methods available for various gas cleaning problems.

SMOKE CONTROL AREAS

Progress Report

POSITION TO JULY 1, 1963—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation	44	1
Acres, **3,400**		
Premises, **41,060**		
Smoke Control Areas in Operation	1,029	32
Acres	**205,888**	**15,675**
Premises	**1,129,669**	**70,009**
Smoke Control Orders		
Confirmed	302	9
Submitted	104	6
Grand Totals	1,479	48

The lists below are supplementary to the information in the last issue of SMOKELESS AIR (Summer, 1963), which gave the position up to April 1, 1963. They now show the changes and additions to July 1, 1963.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Areas in Operation

Acton B. No. 5, Aireborough U.D. No. 11, Aldridge U.D. Nos. 6 and 14, *Audenshaw U.D. No. 2, Battersea M.B. No. 3, *Bebington B. No. 8, Birkenhead C.B. No. 2, Birmingham C.B. Nos. 6, 35 to 37, 48 to 50, 64 to 80, *Blaydon U.D. No. 1, Blaydon U.D. No. 2, *Bolsover U.D. No. 1, Bolton C.B. No. 19, Bootle C.B. No. 4, Bradford B. No. 4, Brentford & Chiswick B. No. 3, Burnley C.B. No. 3, Chadderton U.D. No. 3, *Chadderton U.D. No. 4, Chesterfield B. No. 4, Chesterfield R.D. No. 3, *Crawley B. No. 3, Crompton U.D. No. 2, Croydon C.B. No. 4, Denton U.D. No. 6, *Derby C.B. No. 2, Droylsdon U.D. No. 2, Ealing B. Nos. 10 and 11, Elstree R.D. No. 2, Exeter C.B. No. 3, Finsbury M.B. No. 3, Glanford Brigg R.D. No. 1, Hackney M.B. No. 5, Halesowen B. Nos. 15 to 17, *Halifax C.B. No. 6, Hammersmith U.D. No. 4, Harrow B. No. 4, Hayes & Harlington U.D. No. 19, *Hazel Grove & Bramhall U.D. No. 1, Hemel Hempstead B. No. 3, Heywood B. No. 3, Horsforth U.D. Nos. 9 to 13, 15 and 16, Huyton-with-Roby U.D. No. 3, Ilford B. Nos. 2 and 3, Irlam U.D. No. 2, Islington M.B. Nos. 9 and 10, Kirkby U.D. No. 3, Knottingley U.D. No. 4, Lambeth M.B. No. 2, Leeds C.B. Nos. 20 to 23, Letchworth U.D. No. 1, Lewisham M.B. No. 12, Luton B. No. 2, *Mansfield B. No. 2, Morley B. Nos. 13 to 20, *Newcastle-under-Lyme B. No. 2, Newcastle-upon-Tyne B. Nos. 6 and 7, Northfleet U.D. No. 2, Nuneaton B. No. 7, Ossett B. No. 3, Padiham U.D. Nos. 3 and 4, Prescot U.D. No. 3, Prestwich B. No. 5, Radcliffe B. No. 2, Rotherham C.B. No. 11, *Salford C.B. No. 6, Scunthorpe B. No. 3, Solihull B. Nos. 2 and 3, Southall B. No. 4, Spenborough B. No. 3, Staines U.D. No. 3, Stoke-on-Trent C.B. No. 12, Stretford B. No 3, Thurrock U.D. No. 2, Wallasey C.B. No. 9, Wallsend B. No. 2, *Walthamstow B. No. 3, Walthamstow B. Nos. 4 and 5, Wednesbury B. No. 2, West Bromwich C.B. Nos. 8 and 10, Westhoughton U.D. No. 1, Whitefield U.D. No. 4, Wilmslow U.D. No. 10.

New Orders Confirmed but not yet in Operation

Acton B. Nos. 6 and 7, Aylesbury B. No. 1, Barking B. No. 5, Batley B. No. 3, Bethnal Green M.B. No. 5, Billingham U.D. No. 2, Birkenhead C.B. No. 3, Birmingham C.B. Nos. 89 to 94, Blaby R.D. No. 2, Bolton C.B. No. 20, Bootle C.B. No. 5, Bromley B. No. 5, *Chadderton U.D. No. 5, Chingford B. No. 3, Crayford U.D. No. 2, Croydon C.B. No. 5, Derby C.B. Nos. 4 and 5, Dewsbury C.B. No. 5, Elland U.D. Nos. 1 to 3, Enfield B. No. 4, Eston U.D. No. 1, Failsworth U.D. No. 3, Gillingham B. No. 2, Glanford Brigg R.D. No. 2, Hackney M.B. No. 7, Halesowen B. Nos. 4 and 19, Halifax C.B. No. 7, *Harlow U.D. No. 2, Harlow U.D. No. 3, Harrow B. No. 6, Heywood B. No. 4, Hindley U.D. No. 2, Huddersfield C.B. No. 7, Islington M.B. Nos. 11 and 12, Lambeth M.B. No. 3, Leeds C.B. No. 24, Manchester C.B. No. 8, Mansfield B. No. 3, Middleton B. No. 9, Mitcham B. No. 1, Morley B. Nos. 22 to 24, Newcastle-under-Lyme B. No. 3, Newcastle-upon-Tyne C.B. No. 8, Newton-le-Willows U.D. Nos. 1 and 2, Nottingham C.B. No. 4, Nuneaton B. No. 8, Oldham C.B. No. 5, Ossett B. Nos. 5 and 6, *Paddington M.B. No.4, Paddington M.B. No. 5, Prestwich B. No. 6B, Reading C.B. No. 8, Rochdale C.B. No. 5, Romford B. Nos. 1 and 2, Rothwell U.D. Nos. 3 to 5, Scunthorpe B. No. 4, Shoreditch M.B. No. 5, Slough B. No. 5, Smethwick C.B. No. 6, Spenborough B. No. 4, Staines U.D. No. 4, Stoke-on-Trent C.B. No. 11, Stourbridge B. No. 18, Stretford B. No. 4, Sutton-in-Ashfield U.D. No. 1, Swinton & Pendlebury B. No. 3, Tipton B. No. 1, Wakefield C.B. No. 7, Walthamstow B. No. 6, Wandsworth M.B. No. 5, Watford B. No. 3, Wath-upon-Dearne U.D. No. 2, Wednesfield U.D. No. 5, *West Hartlepool C.B. No. 1, Westminster M.B. Nos. 10 to 13, *Wetherby R.D. No. 1, Widnes B. No. 3, Willesden B. No. 5, Yiewsley & West Drayton U.D. No. 4.

New Orders Submitted for Confirmation but not yet Confirmed

Bedford B. No. 2, Bingley U.D. Nos. 7 to 9, Blackburn C.B. No. 4, Brentford & Chiswick B. No. 4, Carshalton U.D. No. 4, Chislehurst & Sidcup U.D. No. 1, Church U.D. No. 4, Crompton U.D. No. 3, Denton U.D. No. 7, Ealing B. Nos. 14 and 15, Exeter C.B. No. 7, Felling U.D. No. 3, Halesowen B. No. 20, Hartlepool B. No. 1, Hayes & Harlington U.D. No. 22, Heanor U.D. No. 1, Hendon B. Nos. 7 and 8, Heston & Isleworth B. No. 7, Irlam U.D. No. 3, Lambeth M.B. Nos. 7 and 8, Leeds C.B. Nos. 25 to 37, Merton & Morden U.D. No. 4, Morley B. Nos. 25 and 27, Ossett B. Nos. 7 and 8, Poplar M.B. No. 15, Pudsey B. No. 4, Salford C.B. No. 7, Solihull B. No. 4, Stourbridge B. No. 19, Sutton Coldfield B. No. 1, Swinton U.D. Nos. 2 to 5, Wallasey C.B. No. 10, Walsall C.B. Nos. 5 to 8, Walthamstow B. Nos. 7 and 8, Whitefield U.D. No. 5, Wolverhampton C.B. Nos. 4 and 5.

SCOTLAND

New Smoke Control Orders in Operation

Dumbarton Burgh Nos. 3 and 4.
Glasgow (Provan, Part A)
Motherwell (Forgewood)

New Smoke Control Orders Confirmed but not yet in Operation

Dumbarton Burgh No 5.
Grangemouth (Beancross)
Stirling County (Bannockburn No. 1.)

New Smoke Control Orders Submitted for Confirmation but not yet Confirmed

Glasgow (Shettleston and Tollcross)

£100 *Awards*

It is announced that the National Coal Board, in collaboration with the Combustion Engineering Association, is offering an annual award for the best paper on any aspect of the preparation, distribution and utilization of solid fuel. The winning paper will be presented each year at a meeting of the C.E.A. Further information will be forwarded on request to the Director of the Association, 70 Jermyn St, London S.W.1—and from whom copies of the reports mentioned above may also be obtained.

Report of the Alkali Inspectors

Ten Thousand Visits and Inspections

99th Annual Report on Alkali, &c., Works by the Chief Inspectors for 1962. H.M.S.O. 5s. 0d. net

The decision of the Central Electricity Generating Board to build a single 650 ft. chimney at a new 2.000 mW power station at Eggborough is a major development in the field of dispersal of waste gases by the use of tall chimneys, states the Chief Alkali Inspector for England and Wales, Dr. J. S. Carter, in the new report.

He continues: "With such an enormous fuel consumption the proper and adequate dispersal of waste gases is of crucial importance. If they can be discharged by means of one stack the massive heat content of the gases will cause the plume to rise to great heights through thermal buoyancy and thus to be more effectively dispersed into the upper atmosphere. Until quite recently considerations of maintenance and plant availability have militated against the use of a single stack. A careful reappraisal of the whole matter, including novel methods of chimney design has led to the view that single chimneys are practicable for stations up to 2,000 mW capacity. Such a chimney, 650 ft. in height, will be built for Eggborough and such single stack technique is likely to become common practice at future stations."

Iron and Steel

Co-operation between the Alkali Inspectorate and the iron and steel industry on outstanding problems of air pollution continues to be good at both national and works level, says Dr. Carter. "Broadly speaking good progress, excellent in some fields but somewhat less so in others, has been made. Outstanding problems are now sharply defined. The most important single event in 1962 was the commissioning of the new Spencer Works of Richard Thomas and Baldwins Ltd., at Newport. This is the first integrated works to be built since the 1958 Order (under which the inspectorate assumed responsibility for emissions from iron and steel works) came into operation. All matters concerning the treatment of emissions and of chimney heights were discussed and agreed at the design stage. All our requirements were met."

Cement Works

During the year there was again "appreciable complaint" on the score of dust emission from cement works. "By far the most serious and most disturbing of these concerns the cement works on both sides of the river in the Thames-side region between Dartford and Gravesend. Here in an area of about 8 square miles 4·5 million tons of cement are made yearly; the most intensive area of cement production in the world . . . .

"The root cause of the trouble is the approaching exhaustion of available Eocene clay supplies in North Kent and the consequent use of ever-increasing proportions of estuarine clay from the Cliffe marshes. Use of this latter clay is unfortunately accompanied by an increased dust burden. . ." Arrangements to supply the North Kent works with Eocene clay from the Essex side of the river are proceeding and Dr. Carter says that it will be the summer of 1963 before the position about the supply of this clay will be fully secured.

The number of specific complaints investigated by the Inspectorate in

1962 concerned 297 works, compared with 283 in 1961, and 292 in 1960, and as in earlier years the degree of justification varied. Complaints concerning registered works were most numerous against gas and coke works (47), ceramic works (41), electricity works (33), iron and steel works (27), aluminium works (14) and cement works (13). There were also 16 complaints against the overall emission from an industrial area rather than against any specified works. The total number of visits and inspections carried out during the year was 10,768 compared with 10,583 in 1961.

SCOTLAND

In his Annual Report to the Secretary of State for Scotland, the Chief Alkali Inspector for Scotland, Dr. E. A. B. Birse, indicates that measures taken by firms to prevent discharges of noxious and offensive gases from registered premises were generally satisfactory. In a small minority of premises there was recurring need to call attention to necessary repairs to plant but these were all carried out eventually. Fewer registered premises than in 1961 were the subject of complaint but there were repeated complaints against certain premises which had been under complaint in previous years. The total number of visits and inspections carried out during the year was 781 compared with 809 in 1962 and 528 in 1960. Sixty-four chemical tests were carried out during the year to check whether the provisions of the Act were being observed, compared with 75 in 1961.

The Report states that complaints grew in volume against the older electricity generating stations with less efficient grit arrestment, including some steam raising plant without grit arresters which had to be brought into operation to cover demand in peak load periods. Following discussions with the industry the use of a higher grade of washed coal at some of the oldest plants as an immediate palliative showed a promising improvement. In other plants grit arresters are to be fitted, but the report records that the question of further improvement is still much to the fore as there appears to be little prospect of these older plants being put out of commission for some considerable time.

Three cases of fire in colliery bings were referred to the inspectorate by local authorities for advice during the year and Dr. Birse, points out that one of these fires reflected what might unfortunately become a trend arising from the recent closure of uneconomic pits. The fire was caused by the removal of relatively small quantities of blaes by general contractors. "When the local authority became aware of the consequences they took steps to have extraction of blaes stopped but the damage had been done. It is much to be hoped that other local authorities will hear of this unfortunate case which shows that any desultory nibbling at the removal of bings will not only fail to improve amenity but detract from it by stirring up quiescent bing fires. Years of work in consolidation can soon be undone."

Flambeau

This is the title of a new quarterly published for the Gas Council by W.P.R. Ltd., of Fleet Street. Described as a review of industry and commerce, it is a most attractive prestige-type of glossy, with colour on every page, and produced with notable expertise. But it would not be fair to fall into the obvious trap and describe it as flamboyant. It contains much interesting material, some of it on unexpected uses of gas in industry, and reflects the new vigour and confidence that is to be found in the industry.

The Gas Council has also issued a new industrial brochure "Steel Analysis and Normalizing with Town Gas", which shows the versatility of gas applied to these processes. The brochure, which is illustrated by a wide variety of photographs, both colour and black and white, describes several of the plants using these processes, many of them recently commissioned.

Steel Foundry Melting Furnaces

Conference on the Control and Collection of Fumes

A one day conference on this problem was held by the British Steel Castings Research Association at York on April 28, 1963. *The report that follows is based on the volume of Proceedings now published by the Association* (*East Bank Road, Sheffield* 2) *at* 20*s.*

THE Chairman, W. S. Scott (The Darlington Forge Ltd.), Chairman of B.S.C.R.A. Council, recalled that the theme of their Conference was first discussed at a B.S.C.R.A. Conference in 1958 when they had Alkali Inspectorate policy defined for the first time. In 1960 the Association was again given a definition of the policy of the Inspectorate when Dr. Mahler first proposed the target for emission of ·05 gr./ft.^{3}. This newly-defined target came as a shock to many people as only two years earlier it had been suggested that the Inspectorate would be satisfied if emissions were merely contained, the coarse particles removed and the remainder discharged into the atmosphere through a tall chimney.

The steel foundry industry had now had a further three years in which to recover from this shock, said Mr. Scott. They had lived with the problems it had produced and in their conference would review progress to date.

The Chairman commented on the substantial progress being made, as evidenced by the fact that seven of the papers to be read referred to actual operating experience by different manufacturers. Fifteen electric arc furnaces at work in steel foundries were equipped with complete fume control and collection equipment. Another 13 were planned, some of which were nearing completion. He then went on to warn the conference that the requirements of the Inspectorate to suppress fume from steel making by the economic and convenient cupola-converter process might sound its death-knell and pointed out that under present trading conditions the rigorous enforcement of regulations might necessitate the closing of some foundries.

Then followed a welcome to the visitors, lecturers and the technical press who included R. A. Hacking, a Member of the Executive Council of the National Society for Clean Air and Mr. F. M. Shaw who will be remembered for the excellent paper on Air Pollution from Ironfoundry Cupolas presented at the 1962 Harrogate Conference of the Society.

The first paper by Professor R. J. Sargant and C. M. Stock had the conference title as its subject and was presented by Mr. Stock. After a historical review in which reference was made to comparatively small contribution of steel foundry melting units in comparison with other sources of atmospheric pollution the paper suggested a much less strict target of discharged solids would be justifiable.

In dealing with electric arc furnaces not using oxygen the authors drew attention to the agreed statement that followed consultations between B.S.F.A.-B.S.C.R.A. Clean Air Committee, and the Chief Alkali Inspector, Dr. Carter. New furnaces operating without oxygen lancing should have sufficient space left available for the installation of cleaning plant in case of future need.

When using oxygen, new arc furnaces, irrespective of size, must be equipped to meet the ·05 gr./ft.^{3} standard on installation. Existing furnaces of small capacity will be given a further period of grace to allow for emergence of suitable fume arrestment plant. All which were the subject of justifiable complaint will be required to equip with gas cleaning plants to reduce fume loading of exit gases to the prescribed standard.

The paper defines brown fume as consisting of particles of less than five microns with a large proportion of particles of less than one micron, the main constituent being iron oxide and deals with its control and collection. Roof collection is excluded as a control method while hood exhausts with a bag filter are favoured for small furnaces while those above 10 ton should have direct extraction.

The advantages of the direct exhaust method are emphasized and the critical appraisal of this system in the recent work of E. Davies and W. T. Cosby ("The Control of Fume from Electric Arc Furnaces") is mentioned as the first full account of operational experiences of the system.

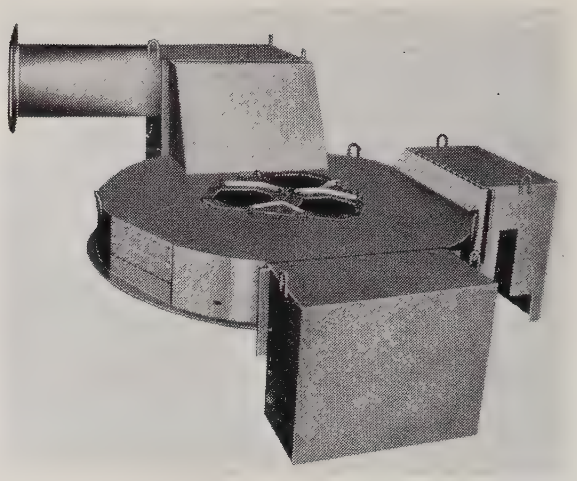
The relation to the standard of fume concentration should be examined. The new semi-direct exhaust design, now in its second year of operation on a five-ton arc furnace is explained and the paper concludes with a survey of the three methods of fume collection acceptable to the Alkali Inspectorate: (*a*) the electrostatic precipitator, (*b*) the bag filter, (*c*) high efficiency wet scrubber—the main disadvantage militating against the more ready acceptance of the electrostatic precipitator being its high capital cost.

Trapping Fumes

The conference considered the problems of the inflammability of exhaust gases from electric melting furnaces. J. N. Leiper then introduced a paper on *Trapping Electric Arc Furnace Fumes* with special emphasis on trapping them at source.

Prior to the war, fume control was virtually unknown but by 1948 there had developed a growing awareness of the need for it, not only to improve working conditions but also to reduce fouling of buildings and atmospheric pollution.

The paper refers to periods prior to the Clean Air Act as being years of growing impetus to thoughts about control and reminds the industry of the compulsive nature of the Act. The early stages of "shoe-string" tackling of the problem are mentioned as is their inevitable failure but tribute is paid to those early attempts that revealed the magnitude of the problem.



Furnace Exhaust Hood (*J. N. Leiper*)

"Fish frier" hoods, suction hoods and other primitive attempts to confine fumes gave way to the all-enveloping hood with extensions projecting over the doors and tap spout, a method that had a period of favour over all earlier methods and can be considered the penultimate stage in the development of methods to trap arc furnace fumes.

The paper goes on to examine the detrimental factors of such a hood, not the least being high installation and running costs and explains the inevitable concentration on a method of extracting fumes direct from the furnace chamber—a method now in favour and one that should be pursued with vigour, provided that the metallurgist pronounces favourably upon it. A detailed explanation of the installation problems follow and some useful comment on related explosion hazards arising from carbon monoxide generated in the furnace bath, particularly during oxygen lancing and also, to a lesser extent, due to unburnt hydrocarbons from oily scrap during melt down period. The paper concludes by counselling prudence. The data from large furnaces using the method should be awaited before

Exhaust hood fitted to 30 *cwt. furnace* (*J. N. Leiper*)

being dogmatic about the cautious attitude of metallurgists to it.

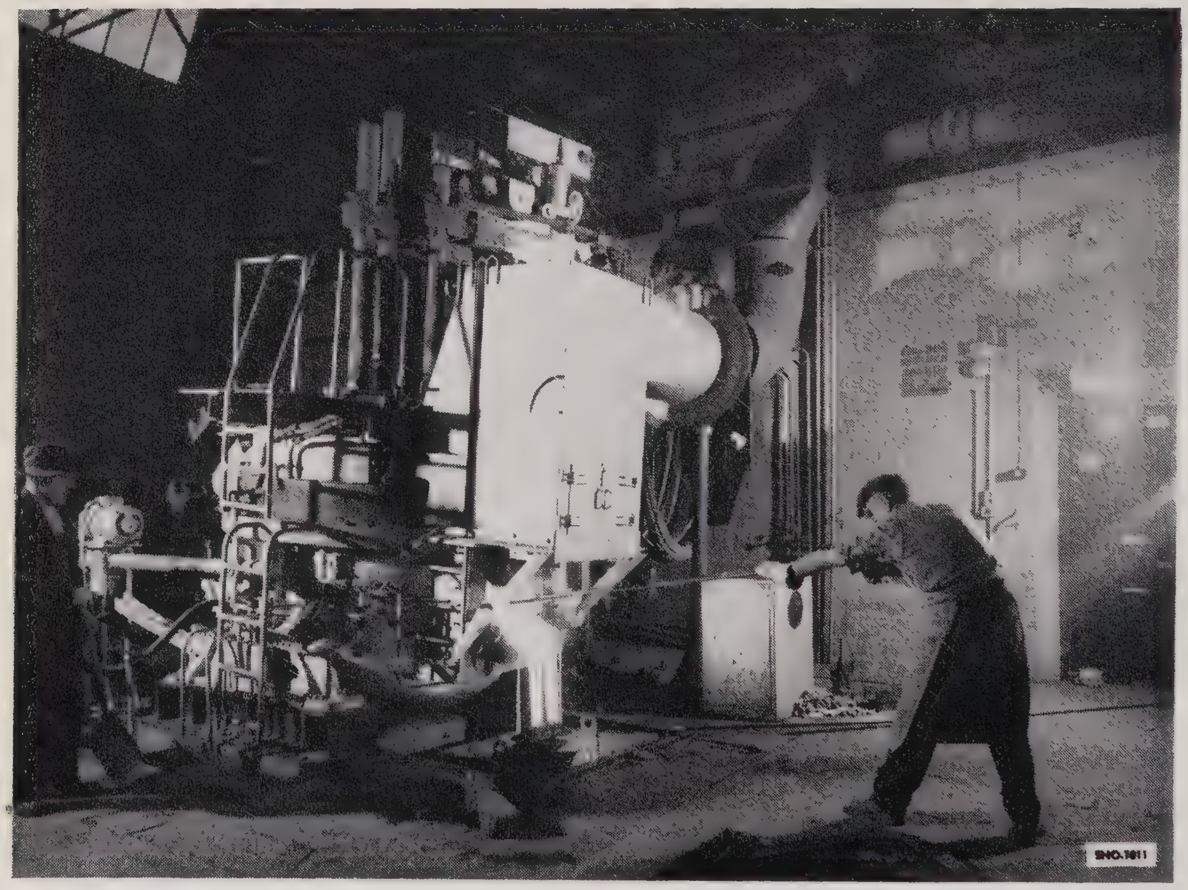
Venturi Scrubber

A. E. O'Broin, the Research and Development Engineer of Ambuco Ltd., and C. J. D. Clement, a former Chief Engineer of the same company, presented a paper on *The Application of the Ambuco Venturi Scrubber to the Direct Extraction of Fumes From Medium Size Electric Arc Furnaces.*

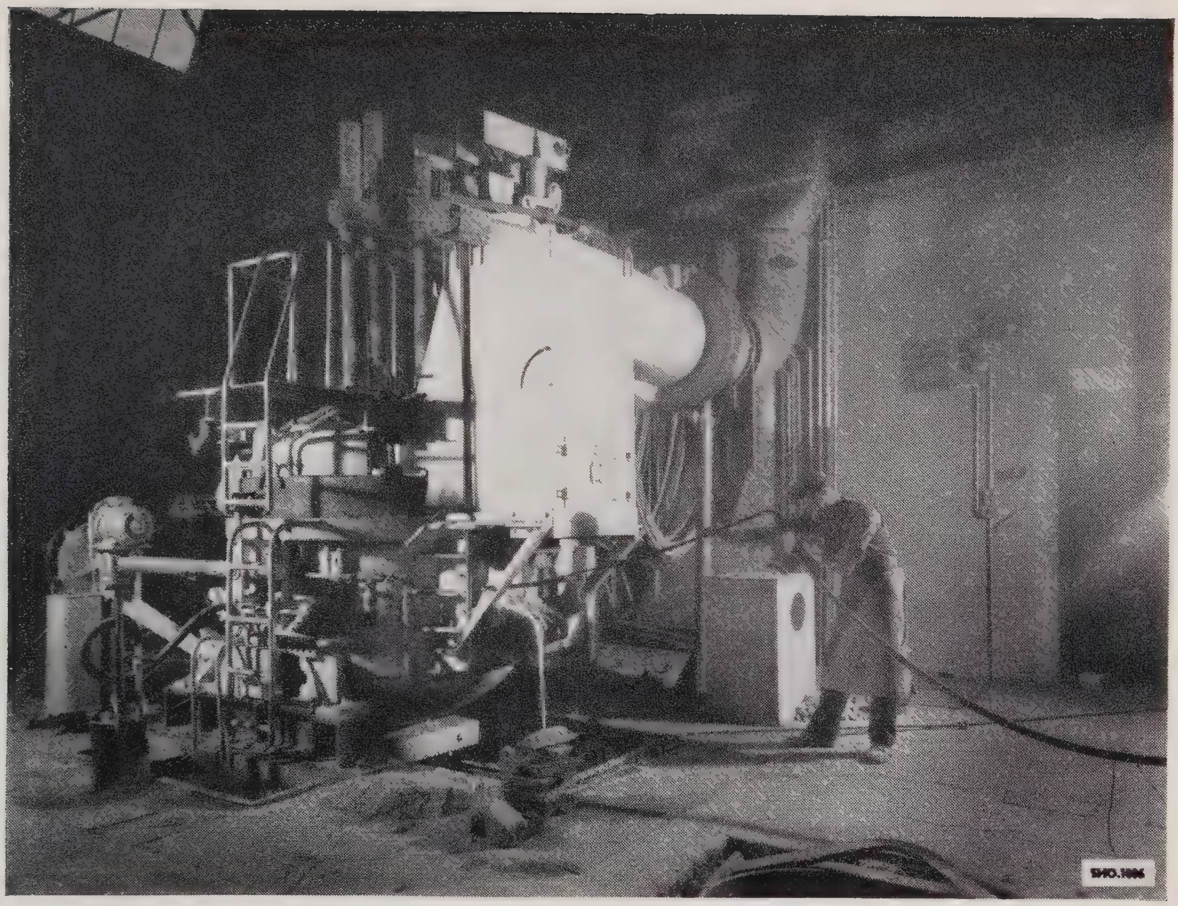
The paper describes the action of the scrubber—virtually a cloud of dust particles interacting with a cloud of water drops, the subsequent impaction and interception due to the relative velocity between the particles and the drops causing the former to be separated. The system is explained in great detail and the authors proceed to apply the principles to the everyday problem of controlling foundry dust. As the requirements of a modern foundry are assessed they emphasize the advantages to be obtained by direct extraction of fumes at the same time pondering on the engineering problems remaining to be solved. Design and installation problems are considered and the advantages of the remote control system explained. Of special interest is the description of how the dust is removed from the gas by the scrubber passing through the sludge hopper into an effluent tank. The dirty water from the latter is pumped to an Ambuco-Stellar candle filter where the solids are removed. The clarified water is returned to the water tank and used again.

E. K. Riley and G. T. Middleton of Newton Chambers & Co. Ltd., introduced a paper on *Fume Cleaning with the Meridrall Filter*, by referring to the traditional methods of removing dust from useful gases resulting from metallurgical operations. The paper deals with the new set of conditions arising from the increasing use of oxygen in the manufacture of steel, in which the effluent gases contain dust of very small particle size in high concentration. These are discharged to the atmosphere in an intense, reddish brown plume and are becoming totally unacceptable from an air pollution prevention viewpoint. The authors explain how these can be reduced to a "mildly coloured, aesthetically acceptable smoke discharge" and regard the wet dust collector as well suited to the process and becoming of increasing importance and potential. The Meridrall filter is a special wet scrubber and is able to maintain a constant efficiency at all through puts by unlimited variation of the throat area. It has been selected in connection with one of the more promising systems for controlling combustion of take-off gases and the results of its working on the largest commercial scale are expected within the course of a few months.

A paper on *Fume Control from a 30-cwt. Electric Arc Furnace*, presented by L. Blackburn, the General Manager of the Fan Engineering Division of Spencer and Halstead Ltd., related to an extraction system installed and commissioned in February 1962. A roof hood was manufactured from



Fume control from a 30 cwt. Electric Arc Furnace—Top, general view of equipment, showing filter, fan, discharge and suction ductwork. Below, view of the furnace and inside extraction equipment during oxygen lancing



Slagging operation with furnace tilted slightly towards the operator when the suction is still effective

$\frac{5}{16}$ in. and $\frac{1}{4}$ in. steel plate and a well insulated branch line of ductwork allowed cold air to mix with hot gas when necessary and an electrically operated proportional controller was inserted in this branch line to operate a butterfly valve.

The plant was immediately effective though some costly teething problems had to be overcome. The author details the running cost, using a 25 h.p. motor and mentions that if time is being lost due to the intolerable fume content in the foundry when lancing it may well be more economical, in the long run, to install an extraction system, irrespective of any consideration of the Alkali Inspectorate Regulations.

Tilghman's Approach to Arc Furnace Fume Control

This paper was presented by B. J. Squires, Manager, of the Dust and Fume control division of Tilghman's Ltd. It outlines the acceptable methods used to control and clean the fumes from an electric arc furnace and mentions the 30 fume hoods built directly on top of furnace roofs which have been installed in this country. These have been in use for periods of up to 15 years.

The paper stresses the simplicity of operation, lack of instrumentation and controls and low temperature of the exhaust gas volumes that characterize the fume hood. The characteristics of individual furnaces affect the design of a close fitting hood and the special provision of a further hood over the slagging door is of special significance in view of the great escape of fumes normally occurring here.

The factors conditioning the selection of correct exhaust volume present problems best resolved on the basis of experience. Factors to be considered are:

(i) The amount of hooding permissible.

(ii) Type of material charged (clean,

mixed, oily scrap, etc.).
- (iii) Oxygen lancing rate and time.
- (iv) Furnace melt time.
- (v) Actual charge weight.
- (vi) Fuel consumed.

Direct shell evacuation and semi-direct fume control are alternative applications of the system and the advantages of the latter system of fume control on electric arc furnaces, including reduced running costs, are stressed.

When the author comes to deal with arc furnace fume cleaning the extremely fine nature of the dust present in fumes is mentioned (60 per cent below one micron). He suggests that fabric filter dust collectors are ideally suited to meet the latest recommendations regarding high-efficiency dust collection.

The new medium temperature fabric filters have been produced to meet the demand from the steel foundry and chemical industries. Twelve sizes of single compartments are produced. Although synthetic filter materials are used improved design ensures long life.

High temperature fabric filters using fibreglass clock will now cope with gases up to 650°F. Used in bag filter plants where cleaning is done by mechanical vibration it can be cleaned by a simple and less severe method known as reverse flow cleaning which ensures a tube life of two years.

World-wide use is being made of these filters in carbon black plants where they are replacing electrostatic precipitators. One is operating in the U.S.A. on an arc furnace exhaust system on two 100-ton furnaces with direct shelltop evacuation.

Two new items of equipment are now used with considerable success for the disposal of fine dust collected in a dry state: the pelletizing machine and the twin paddle wet mixer. The paper explains their operation and of particular interest in the latter item is the ability of the operator to vary conditions of dust leaving a collector unit from damp dust to wet slurry, and concludes with a reference to economic advantages of these inexpensive dust conditioners.

Arc Furnace Fume Cleaning

A. S. Hipkin of Visco Ltd. presented a paper on this subject. This directs attention to alternative means of controlling the fume generated at furnaces and points out that experience has shown that complete control is not obtained unless direct extraction of between seven and eight times the volume of oxygen injected is achieved, in terms of normal temperature and pressure. More than three quarters of the air/gas mixture must be induced into the furnace from the atmosphere to prevent fume emission. The temperature is likely to be about 1,200°C. and, depending on the efficiency of oxygen conversion, and burning of carbon monoxide may be explosive.

This latter probability has been examined with explosive experts and preliminary recommendations were made that the volume of the air/gas mixture downstream from the furnace should be of the order of 20 to 25 times the rate of oxygen lancing.

The paper proceeds to illustrate the practical application of this safety measure and emphasizes the need to introduce forced combustion when the CO content of fume is 13 per cent of volume. The subsequent burning necessitates cooling by a water spray injection system and the author gives the case-history of a foundry in Scotland using a water-cooled fume outlet.

Irrigated electrostatic precipitators are commended for dealing with ultra-fine solid matter and their characteristics, explained, special attention being paid to the cost factor and space requirements.

Discussion

Dr. W. T. Crosby of W. C. Holmes and Co. Ltd. commented on the papers at this stage of the conference and his oral contribution included a warning that there was a tendency to minimize the fouling of atmosphere adjacent to arc furnaces throughout their operating cycle—a task more difficult than effecting the cleaning of effluent gases to the degree requested by the Alkali Inspectorate. His talk dealt with the practical aspects of the control of fume from arc furnaces and expressed the view that complete clearance of the furnace area was attainable.

The most important single issue related to fume containment requiring attention was that of providing at all times a source of ignition for combustion gases leaving the furnace as self-ignition could not always be relied on.

In the ensuing discussion the standpoint of the user was put in relation to the selection of the right type of dust extraction equipment. A warning was given about wet scrubbers using outside water-cooling in severe weather, and F. M. Shaw commented on the application of Le Chatelier's law for dirty gas in predicting the inflammability of gas. This did not hold under some conditions as the dust particles in dirty cupola gases might catalyse combustion. In addition the law neglected the effect of temperature and could lead to a rather optimistic view of whether or not an explosive hazard was likely to exist.

His view was challenged by Prof. R. J. Sarjant who concluded that where opportunities have existed to verify the application of the Le Chatelier's principle in practise it has given a positive answer.

F. E. Ireland (Deputy Chief Alkali Inspector) referred to confusion over the difference between the Clean Air Act and the Alkali Act. The latter was in its centenary year, the former was in its seventh. In fixing a standard for fume emission they were not protecting the amenities of the public at the cost of safeguarding the employees against the explosion hazard. It was for the industry to ensure that whatever system it installed was inherently safe. The Inspectorate was being lenient with those using hooded extraction because working to the same concentration they are emitting far more and extracting two or three times the amount of gases than those working to direct extraction.

J. Batey (Superintendent Smoke Inspector, Sheffield) observed that dirty grey fume which could be seen from many arc furnace buildings was an intolerable nuisance and made a plea for improved operating methods to alleviate the nuisance.

Many speakers referred to the problems caused by handling oily scrap and G. R. Shaw suggested that it was cheaper to clean such metal, than to deal with the fumes that resulted from burning it. He asked if it were necessary to form so much oxide in their processing. Could they not prevent the formation of fumes instead of spending an enormous amount of money trying to collect them afterwards?

R. A. Hacking dealt with the problem of basket-charged furnaces being fed with great dollops of oily scrap and the resultant gusts of dangerous hydrocarbon as the oily matter vapourized at a much faster rate than in the case of the door charged furnace.

This discussion period continued with speakers raising many other problems confronting the industry—the evolution of volatiles which arise after charging dirty scrap into a molten bath, the adequate sealing of furnaces to effect a dramatic reduction in fume and the real cost of electricity.

The Cupola Converter

Then followed the presentation of a paper on *The Problem of the Clean Air Act as applied to the Cupola-Converter Process* by A. G. Jeune and W. Gudgeon which investigates the main difficulties encountered in adapting the cupola-converter unit to meet the provisions of the act regarding fume emission.

The cupola converter plant function is explained and the authors deal with the factors affecting dust and fume emission in both the cold blast and hot blast types. As the latter is under the jurisdiction of the Alkali Inspectorate and the former the concern of the Local Authority, two different standards apply. Chimneys must be a minimum of 120 feet though cupolas melting less than seven tons per hour might possibly use an 80 feet minimum stack depending on site conditions.

The paper contains a reminder that the cold blast cupola is under the jurisdiction of the Local Authority, the criterion being grit emission reduction. Therefore a wet type of arrester is adequate to reduce grit emission which because of its particle size is immediately arrested and washed down into the collecting system as a sludge. Unhappily the sulphurous fume is relatively speaking unaffected and is dispersed into the atmosphere. In passing through the collecting system it will quickly cause deterioration and damaging rot.

The hot blast cupola requires a wet type electrostatic precipitator or a Venturi type scrubber as both grit and fume must be dealt with. Sludge concentration equipment is necessary and waste water must be cleaned to a purity laid down in the local bye-laws. The equipment required is expensive and bulky, and it contributes nothing to the increase of output. The paper concludes with a challenge to equipment manufacturers to join forces with the engineer and the operator to solve the problem of efficient collection without undue interference in the operating performance and emphasizes that the problem of fume emission from L.D. plants has been successfully overcome—why not with cupola convertor plant?

Dr. J. S. Carter

In an oral contribution to the Conference, Dr. J. S. Carter, Chief Alkali Inspector, referred to the 100th Anniversary of the passing of the Alkali Act which had come into existence because those making sodium sulphate had discharged all the hydrochloric acid gas they made into the atmosphere—to the great annoyance of the local peasantry, farmers, and so forth.

He went on to refer to an irate letter sent by one alkali maker to another which he dared not publish in his official report but which would appear in the forthcoming issue of SMOKELESS AIR* and reminded his audience that they were either the victims or the beneficiaries of legislation that gave wide powers to one man.

He observed that there were two schools of thought in the steel founding industry. One said that the Chief Alkali Inspector issued a directive to his staff "Find out what the steel founders are doing and tell them that they musn't"; the other proposed that the steel founders should "find out what the Inspector wants us to do then tell him that it is impossible". Somehow or other a reasonable compromise had to be effected.

In a jocular reference to the many reactions to the standard of the burden of the emission (0·05 gr./ft.^{3}) he quoted from his predecessors. "Still, it is not well to stop at any point except perfection" and went on to remind his audience that under the Act they have a statutory obligation to use the best practicable means to reduce emissions to a minimum. In reviewing the problems related to various processes of founding he gave an assurance that the Inspectorate would assume that all parties were people of good will and anxious to be good neighbours. However he had a statutory obligation which was binding to ensure that industry use the best practicable means to reduce emissions to a minimum. Where it was not complying he had to give a hard look to see that it did—he had no alternative.

Another period of discussion concluded the proceedings and in his closing remarks the Chairman referred to the problems posed by Dr. Carter. They were very minor sinners in quantity as far as the Clean Air Act was concerned but to the man in the street they showed up badly and must do something to help implement the Act. They would leave the conference and get down to the job of producing the clean atmosphere that was intended by the Act.

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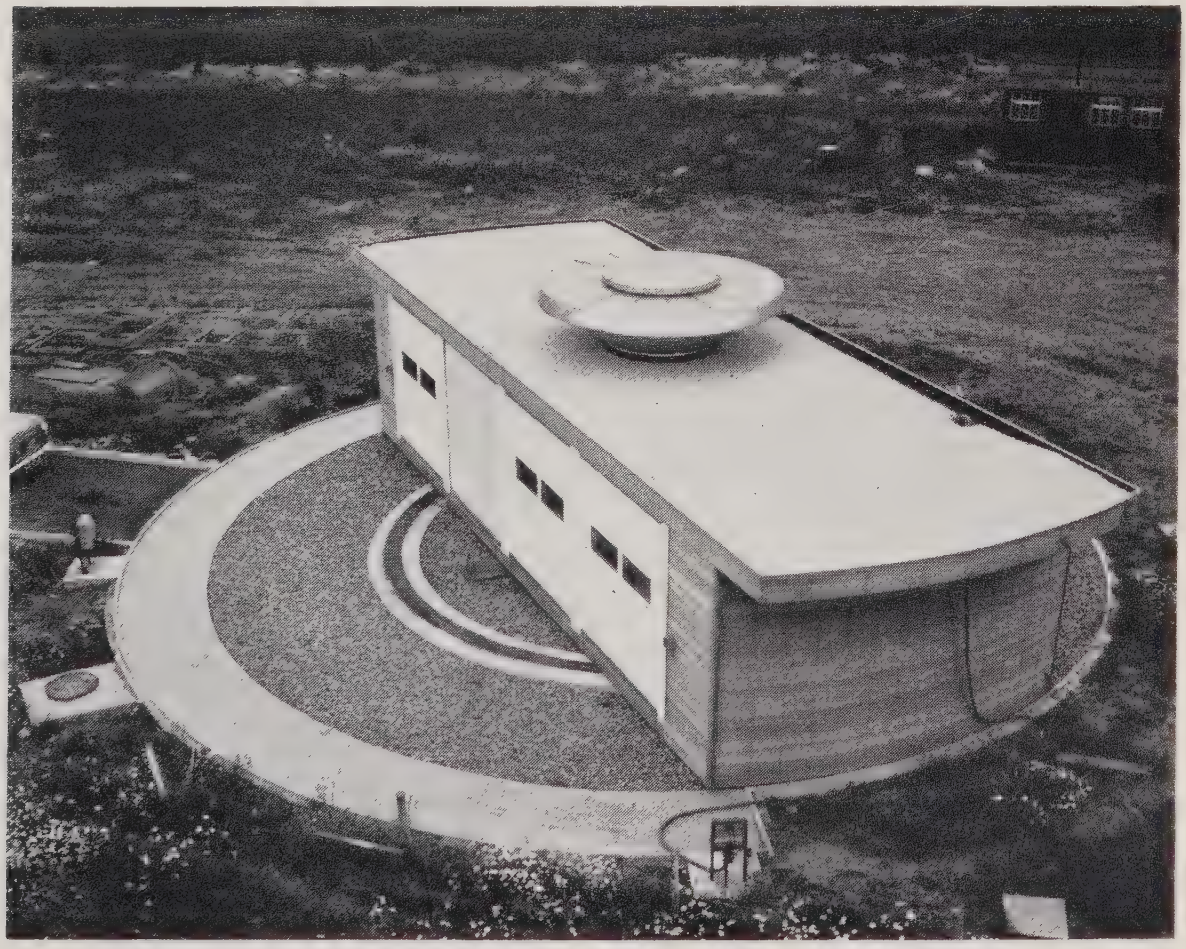
* *i.e.*, Summer, 1963 issue, at page 272.

NEW PHYSICS LABORATORIES AT BUILDING RESEARCH STATION

Making buildings more comfortable to live and work in, is the general aim of the research undertaken in the splendid new laboratories in Garston, Herts. and the fine setting and modern good design of its own building impresses the visitor immediately as a shining example of such an aim. Built for the Physics Division of the Building Research Station at a cost of about £430,000, the new laboratories were formally opened by Mr. Denzil Freeth, M.P., Parliamentary Secretary to the Minister for Science, on July 12, 1963 and a press preview was arranged on the previous day.

Welcoming the representatives of the press, Dr. F. M. Lea, Director of Building Research explained that the work of the new laboratory was divided among teams concerned with the external climate, heating, air movement, lighting and acoustics of buildings. But as reaction of human beings to the environment is most important, the laboratory's purely physical work is paralleled by research on the measurement of sensations such as a thermal comfort and discomfort, brightness and glare and noise.

Efficient heating in buildings is of vital interest to those concerned with preventing air pollution and in this connection the new research laboratories are engaged on studies of thermal response of buildings and thermal properties of walls. A unique feature is a rotatable wall laboratory, specially designed so that a row of four



The new rotatable wall laboratory at the Building Research Station test walls may be exposed to an extreme range of climatic conditions as required. The building can be turned all the way round and the warmth of the walls can be measured over a continuous period of up to several months by the provision of automatic data logging of temperature and heat flow. Each 8 ft. square test wall whose outside surface is exposed to the weather faces inwards to a temperature controlled cubicle. A series of different wall constructions will be tested.

The warmth of a building does not only depend on good insulation. If a building is heated intermittently rather than continuously, the heat absorption calls for an increased rate of heat input to achieve the required temperature, and this, as far as the fuel savings are concerned, partly offsets the reduction in the heating period. The economics of intermittent heating therefore depends on the thermal inertia of the buildings. This is studied in the newly built Pilot Scale Laboratory which is two storeys in height and of heavy construction to minimize the effect of changes in the outside climate. Temperature control is achieved by an ingenious system of skirting heating which provides heating or cooling as required, automatically. In order to study the heat flow characteristic of heated ground floors, electrical floor heating has been installed in the Pilot-Scale Laboratory with one half of the perimeter insulated and the other not.

When formally opening the new laboratories, Mr. Denzil Freeth referred to the research on heating in these terms: "There will always be arguments about the social merits of the open coal fire but, whether on a winter's evening we watch our television sets gathered round the fireplace or with our chairs moving surreptitiously ever closer to a radiator, I think we all agree that nothing is more wasteful or more infuriating than that the side of our bodies near the source of heat should be boiling hot while our tails are frozen by whistling draughts of cold air. Whatever form of heating we may prefer, and however much heating we may be able to afford, there is nothing more infuriating or more wasteful than the consumption of heat which either goes up the chimney or is carried away by incoming draughts. According to Miss Nancy Mitford we love in a cold climate. We certainly live in one in which heating of some kind is very necessary for the major part of the year. And I think it is vital that in the new homes that are going up today the loss of heat which can be prevented by wise building should be reduced as much as possible".

Chronic Bronchitis Report

The Conference on Chronic Bronchitis, Prevention and Management, held in November last by the Chest and Heart Association was reported in our Winter 1962 issue (p. 141). A full report of the conference has now been published by the Association, Tavistock House North, Tavistock Square, London, W.C.1. Price: 10s. 6d. or $2.50.

The recent launching of Methane Princess, *being built for the importation of natural gas from the Sahara, from the Barrow shipyard of Vickers-Armstrongs*

Preview for Scarborough

Conference and Exhibition Prospects

The Society's conference and exhibition at Scarborough from October 8 to 11 promise to be of exceptional interest. The Clean Air, Fuel Efficiency and Domestic Heating Exhibition, which is organized by the Society, will be the largest and most comprehensive of the six so far held. Its principal features are described below.

The conference itself has an attractive and well-balanced programme, covering as many aspects of the clean air effort as can be fitted into one conference, even though it is a day longer than before.

At the opening session on Tuesday morning there will be a civic welcome by the Mayor of Scarborough, Alderman W. H. Smith, J.P., and an address by the Rt. Hon. Lord Hastings, Joint Parliamentary Secretary, Ministry of Housing and Local Government. In view of recent events what he may say will be looked forward to with particular interest. Then will come the first Presidential Address, by Dr. Parker. At the afternoon session smoke control questions will be fully discussed, with two introductory papers a little out of the rut, and all the more valuable for it. The authors are Marjorie Lovell Burgess and Eric Bellingham—both excellent speakers. Dr. Burn will be in the chair.

On Wednesday morning conference will hear a stimulating paper, mainly on health, but entitled "Air Pollution: the Human Problem", by Dr. Mary Catterall, who is also a most attractive speaker. Then will follow a report from the Society's Technical Committee, to be presented by its Chairman, Dr. J. S. G. Burnett, on road vehicle pollution. Dr. P. J. Lawther will be in the chair.

Industrial problems, or rather progress, will be the subject of two complementary papers at the afternoon session. One is by A. N. Britten of Imperial Chemical Industries (Alkali Division) on what his company has done and is doing to comply with the Clean Air Act, and the cost involved; the other being on the experiences of the Technical Committee of the Warwickshire Clean Air Council, which the three authors describe as "an example of co-operation". In the chair will be Councillor Eric Gibbons, of the Society's West Midlands Division and himself an industrialist.

Thursday morning will see a session on "Research and Development", with Mr. Goodfellow presiding. There will be five papers, from Warren Spring, the N.C.B., the Gas Council, Central Electricity Generating Board, and the Electrical Research Association. Much interesting information of the work and progress being made in these different fields will be given. For a break in papers and discussions there will be on the Thursday afternoon a film show of clean air films. An international show, in fact, for the films have been gathered in from the U.S.A., Canada, Czechoslovakia and the U.K.

The conference will end at noon on Friday, after a special technical session on grit and dust emissions. Two papers will be presented: one on the means for control, the other on the administrative problems. Mr. Henry Turner will be in the chair, and the authors are L. Clegg and W. Short of N.I.F.E.S., and F. G. Sugden, C.P.H.I., Middlesbrough.

Details of the various social events, works visits, and visits for the ladies of delegates have been sent out to all who are attending. Registration for attendance at the conference is possible right up to the last moment, but it should be noted that the Society's London offices will have to be closed during the whole of the week.

THE EXHIBITION

The Exhibition will be open during the whole period of the conference, and will be staged in the Spa buildings, where the conference is also being held. It will be formally opened by Lord Hastings immediately after the first conference session, and with the Mayor and the President he will inspect the exhibition after the opening ceremony.

Admittance will be free, not only of course to delegates, but to the public, and a special invitation is being extended to heating engineers, housing architects and members of the trade to visit the exhibition to see the latest developments in smokeless heating methods and equipment.

New Smokeless Fuel

For a number of years, delegates to the Conference have asked representatives of the National Coal Board what progress has been made in the development of a new smokeless fuel from bituminous coal, commonly referred to as "Bronowski Bullets".

Delegates and visitors to the 1963 Clean Air Exhibition will be able to see this new reactive fuel for themselves. The National Coal Board are putting on a special display, telling the story of this new fuel and how it is made. It will shortly be made available to the public under the trade name "Homefire" briquettes. Visitors will also be able to watch the new fuel being burnt in an open grate.

A comprehensive solid fuel display will be staged by the Solid Smokeless Fuels Federation, which will also be demonstrated under fire on solid fuel burning appliances. Particular emphasis will be on fuels which will be in plentiful supply this winter throughout the country.

Another feature on the Solid Smokeless Fuels Federation stand is a new exhibition unit. designed by the Federation for erection in halls or marquees to demonstrate solid smokeless fuels and solid fuel appliances. This equipment is simple to erect and completely self-contained. It is erected and manned by the Federation's own staff and will be offered on loan to local authorities for use in their own exhibitions. Additional sections can be added to the portable display to demonstrate household improvements and conversions or central heating.

The Coal Utilization Council is displaying a full range of the latest type of tested and approved solid fuel appliances, including open fires, room heaters, cookers, domestic and heating boilers, all of which are specially selected for use in clean air areas.

Displayed under fire as working exhibits will be an open fire with high duty boiler heating three radiators and hot water, a freestanding room heater and an inset room heater in attractive settings.

Information is obtainable on the stand of the training facilities available to the local authorities and the trade. These courses deal with the various types of solid fuel heating appliances and the problems arising in their installation.

The Women's Advisory Council on Solid Fuel will have an information section on the stand and members of the staff will be present to discuss with delegates any assistance which can be given to local authorities promoting smoke control areas through women's meetings, etc.

Solid smokeless fuels to be featured on other stands include "Coalite" which will be seen burning in open grates and in a cooker, "Rexco" which is being featured around the theme "Scottish Rexco from Scottish mines for Scottish Homes", and gas coke, or "Gloco".

Gas Industry's Contribution to Clean Air

The uses of gas and coke in the home and the factory are featured in two stands by the Gas Council.

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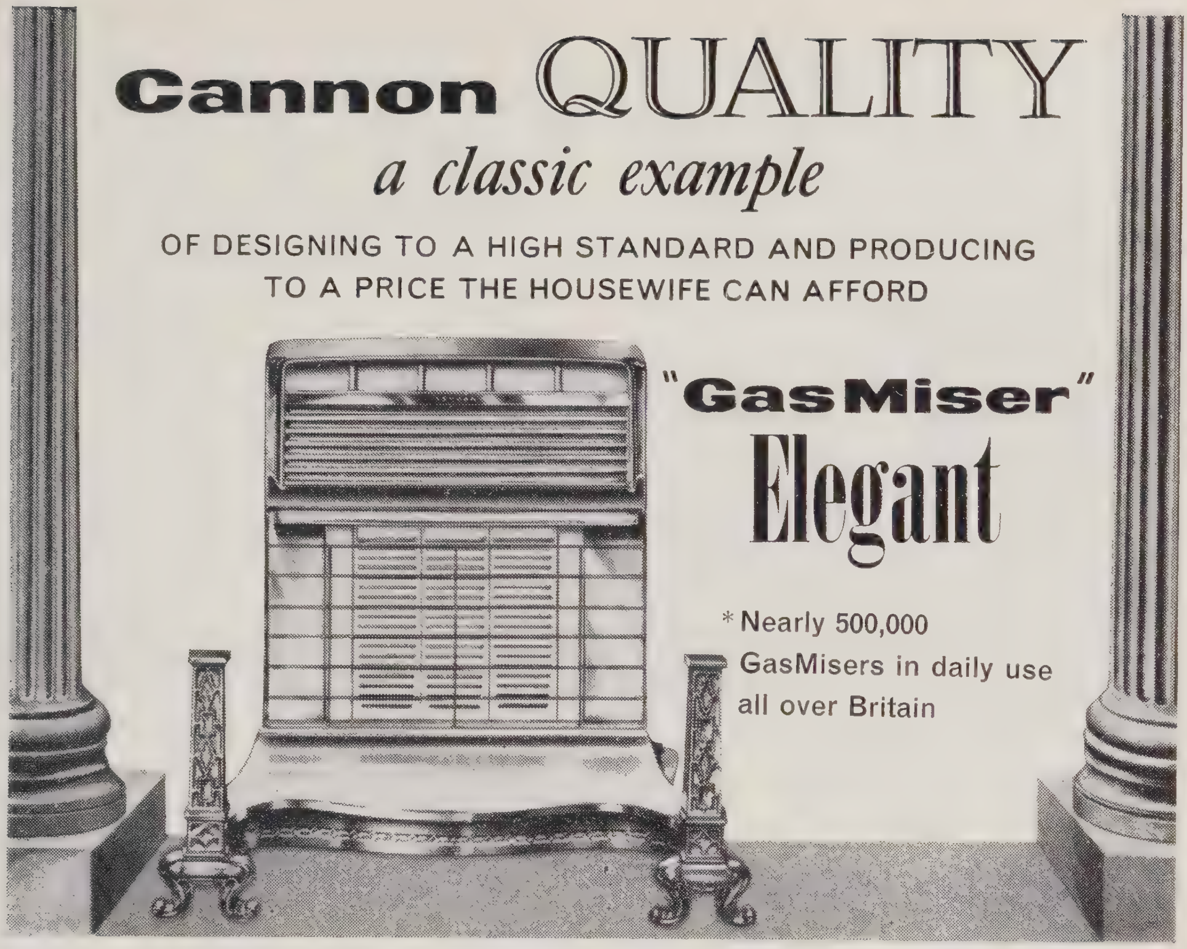

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responsible for the greater part of the smoke over this country, the use of gas in the home is of particular value in fulfilling the requirements of the Clean Air Act. Of special interest in the domestic field, are the new developments in central heating displayed on the stand which satisfy both the need for clean air and greater comfort. They include 'small bore' central heating, which can be installed in existing houses with a minimum of structural alteration, and for a reasonable capital outlay; also gas warm-air heating systems which give either economical "selective" heating or full comfort in all rooms, passages and halls, throughout a house or flat. In addition, a gas circulator, heating a water tank or cylinder, can be fitted to an air heating unit to provide constant hot water all the year round.

Off-Peak Electricity

At this year's exhibition, more space than ever before is being devoted to spot-light the part electricity plays in promoting clean air. The entire length of the main ground floor exhibition hall has been taken by the Central Electricity Generating Board and the Electrical Development Association. In addition, there are a number of manufacturers of electrical appliances displaying their products in various parts of the exhibition. Among those exhibiting for the first time are the General Electric Company (Domestic Equipment) Ltd., Thermodare (Great Britain) Ltd., Revo Electric Co. Ltd., Corsectric Ltd., Smith Bell & Co. (London) Ltd., and Bescol (Electric) Ltd.

Visitors to the Electrical Development Association stand will be able to see some of the ways in which electricity may be used to the advantage of the individual and the community. Particular emphasis is being given to forms of heating which operate at "off-peak" periods at a lower tariff and which store their energy for release at times when the load is heavy.

Electrical floor warming is one such method and this is ideally suited to new houses, flats and commercial buildings. Night storage block heaters are also being high-lighted and several different makes will be on view.

The Rayburn No. 4 *Room Heater*

Other electrical exhibits include water heaters, cookers, refrigerators, waste material disposers and fire lighters specially developed for use with solid smokeless fuels.

The importance of adequate wiring for domestic premises is emphasized and a display feature introduces the new E.D.A. publication, "The Design of Homes for Today and Tomorrow".

Among the electric firelighters is the "Matchless" by Best Products Ltd., which operates from a five-amp supply and, as the makers claim, will ignite every known type of fuel without the necessity of burying the nozzle and thus preventing burnt-out nozzles.

Central Heating

In keeping with the theme "Clean Air and Comfort in the Home", more prominence is being given to central heating of domestic premises. Back boilers, using solid smokeless fuel are featured on a number of stands, and there are gas-fired and oil-fired systems demonstrated.

Exhibiting for the first time are Allied Ironfounders Ltd., who will be showing displays on the technical and educational aspects of clean air and smoke control and of the company's continuous research and development in the solid fuel field. They will be showing their latest examples of domestic and industrial heating and cooking equipment, including boilers, space heaters, radiators and other appliances.

These include the "Rayburn No. 4" Room Heater, which is the re-styled "Rayburn No. 1" and now has a large single glass door. It is a free-standing domestic solid fuel appliance and is available in both boiler and non-boiler models. Other Allied room heaters and fires include the "Rayburn Princess", the "Dale", "Texham", "Lowburn Drop Front" and the re-styled "Aga S.F." boiler.

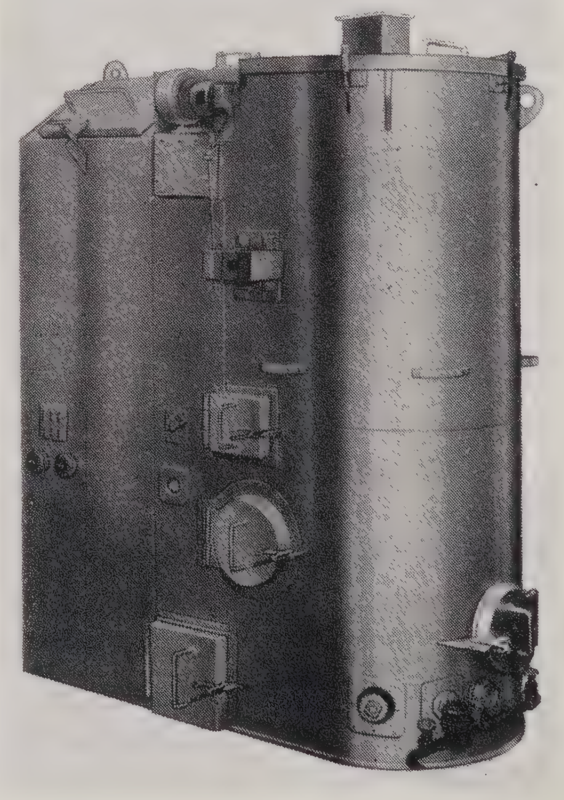
Two other "first-time" exhibitors are Federated Foundries Ltd., of Glasgow, showing the well-known range of "Sofono" solid fuel and electrical heating appliances and their underfloor air unit, and Radiation Parkray Ltd.

Industrial Exhibits

The smokeless combustion ordinary bituminous coal in an industrial boiler is one of the features of the "Stempo" boilers, being shown for the first time by Roberts Bros. (Audnam) Ltd., Meteor Works, Junction Road, Wordsley, near Stourbridge, Worcs. The combustion air preheated by waste gases in a specially designed air heater utilizing the waste products of combustion operates at an efficiency of over 85 per cent resulting in lowest fuel costs obtainable to date. The boilers can be used for production of hot water or steam and are fully automatic in operation including the fuel delivery and ash extraction.

The boilers are packaged and include a 24-hour fuel storage hopper and approximately one week's ash storage space. Automatic fuel feed of the boiler hopper and automatic ash extraction from ash storage space can also be arranged. The vertical arrangement of heating surfaces, fire tubes and smoke tubes and the additional heating surface provided renders high availability of the boiler. The maintenance costs are also very low because the boilers do not need to be cleaned any more than at two monthly intervals, and any parts which may be subject to wear are made robust from the best materials.

The boilers can utilize any type of solid fuel up to 1½ in. size but of course are most economical when utilizing cleaned bituminous fuel such as washed smalls, peas, beans or singles. The boilers are provided with forced and induced draught fans, dampers automatically controlled to maintain both combustion chambers and flue passes under suction so that any possible leakages cause infiltration of clean air into the boiler instead of



The Stempo Boiler

smoke pollution of the boiler house. Only a minimum length of chimney acceptable to the Health Authorities is required as all necessary suction is provided in the induced draught fan. The units available range from 200,000 Btu/hr. to 3,000,000 Btu/hr., 500 lb. of steam/hr. to 3,000 lb. of steam/hr.

Dust, Grit and Fumes

The technical session of the conference is dealing with problems in industry of dust, grit and fume emissions. In the Exhibition halls, manufacturers will be showing equipment and working models to demonstrate how these problems can be overcome.

The Dust and Fume Control Division of Tilghman's Ltd. will show some examples from their wide range of high efficiency, air filtration and gas cleaning plant and equipment, including electrostatic precipitator dust collectors for gas cleaning.

Other exhibitors in this field include Head Wrightson Iron & Steel Works Engineering Ltd., Combustion Equipment Ltd., Collectron Ltd., Ambuco Ltd., and Riley (I.C.) Products Ltd.

A century of progress under the Alkali Acts will be depicted in pictures by the Ministry of Housing and Local Government under the title "Industry Clears the Air". Photographs of modern manufacturing plants are contrasted with old works.

Items of historic interest, such as the first Alkali Act, 1863, equipment in use at that time and reproductions of the first registrations under the Alkali Act will be on view.

In contrast, the latest equipment available to industry is being shown by Head Wrightson Iron and Steelworks Engineering Ltd., including a high efficiency "Flooded Disc Scrubber", capable of collecting submicron particles from process gases; the "cyclo-trell", a multi-tubular collector for high efficiency collection of process dust; fabrics filters for the collection of all dry dusts and fumes and Head Wrightson-Research Cottrell electrostatic precipitators.

A visit by delegates of the Conference to the works of Head Wrightson at Thornaby-on-Tees has been planned for Thursday, October 10.

The John Thompson Group of Companies, manufacturers of steam raising plant and all ancillary equipment, are illustrating products for the efficient combustion of low grade fuels in full compliance with the Clean Air Act.

Photographic panels depict the "Ministoker", which has been evolved to meet the needs of the smaller steam user with a small shell or sectional boiler to fire; the "Travelling Grate Stoker" for larger shell boilers and the Three Pass Rear Ashing Wetback boiler.

Exhibitors this year are drawing attention to impurities in the air inside buildings. Corsectric Ltd. are showing the "Puritron Electronic Air Purifiers" from the U.S.A. Operating on the principle of negative ionization of the atmosphere in rooms, the Puritron units transform a stale, polluted, smoky atmosphere into clean air without using ducts, pipes or ventilation devices.

Stale air is drawn by fans through high efficiency mechanical filters; odours are oxidized by concentrated oxygen; then the air is subjected to ultra-violet rays and, finally, the purified air is highly charged with negative ions at the rate of 12 billion per second before it is recirculated into the room.

"Bell-Air Conditioners" are featured by Smith, Bell & Co. (London) Ltd. These units are used for cooling in the summer and act as humidifiers in the winter. The "Amer-Glas" filter removes particles in the atmosphere down to five microns. The activated charcoal filter absorbs odours.

Another exhibit on the same stand is the "Morwennair" 365 Portable air conditioner. The unit contains $\frac{1}{16}$th h.p refrigeration system giving 10-15°F. temperature drop and 1-2 kW heating for a cool day. Also demonstrated will be the complete range of Wright air conditioners/heat pumps with capacities from 24,000 Btu's to 240,000

Btu's, either as packaged or remote units.

Research and Development

Visitors will be able to see what the various research associations are doing to promote clean air. The British Coal Utilization Research Association will have a model in relief. A model in relief of an Economic Boiler shows how smokeless combustion and low grit emission can be achieved with coal firing, even at high loading, provided that control of air/fuel ratio and the moisture content of the coal is effective and provided that the distribution of the air under the grate is suitably apportioned. They will also demonstrate a "Vortex" type burner for use with raw producer gas on each of the fireholes of intermittent brick kilns, the principles governing the selection and performance of grit arrestors, the cyclone probe method of sampling grit, smoke and dust emitted from chimneys, the principles governing the use of the Ringelmann Chart and a method of measuring the amount of smoke emitted from a domestic chimney.

A small wind tunnel mounted on the stand of the Department of Scientific and Industrial Research will demonstrate typical behaviour of plumes from chimneys sited near to large buildings.

Wind-tunnel tests on models are frequently used to predict the pattern of dispersion of flue gases from a chimney installation. Although such tests have been in use for many years, no thorough study appears to have been made of the extent to which the model tests reproduce full-scale behaviour in practice.

This is now being investigated in a co-operative study by Warren Spring Laboratory and the National Physical Laboratory. Dispersion from a full-scale experimental chimney constructed at the Warren Spring Laboratory is being compared with that in wind-tunnel tests at the National Physical Laboratory.

N.S.C.A. Exhibits

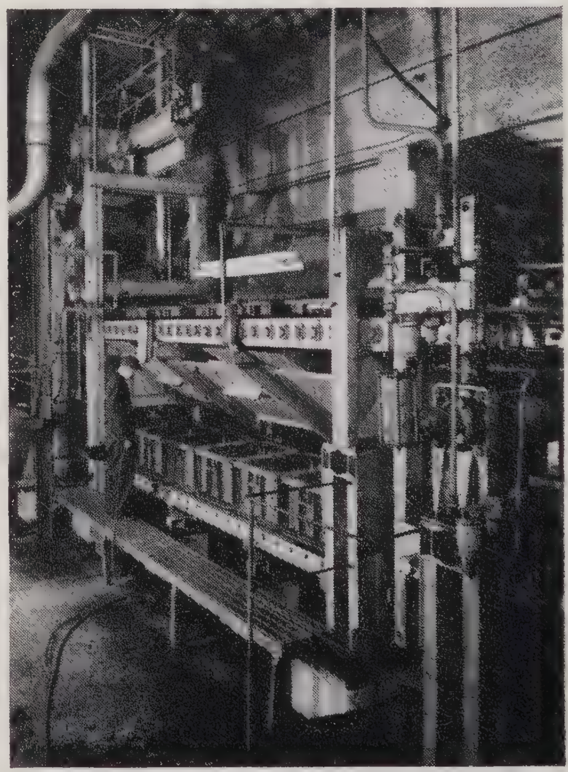
The Society will be showing made-up examples from their two new "Do-It-Yourself" Exhibition display kits which can now be bought by local authorities in connection with their smoke control campaigns.

The first illustrates with photographs and captions six reasons for smoke control. The other kit is designed to provide reasoned answers to objections for smoke control.

On another pictorial display, originated by Dr. Mary Catterall of Leeds Infirmary, visitors will get a graphic picture of "The Poisons We Breathe".

Examples of the Society's publications, new leaflets and posters will be on show, as well as a large display of photographs.

Admission tickets for the exhibition can be obtained without charge on application to the Society at Field House, Breams Buildings, London, E.C.4.



The Minister of Power recently opened the new automated factory of Richard Baxendale and Sons Ltd., makers of the Baxi fires, at Bamber Bridge, near Preston. The photo shows the indexed-in-line Taccone diaphragm moulding plant, first of its kind in the U.K., which gives up to 200 completed moulds per hour

NEWS FROM THE DIVISIONS

The situation confronting Local Authorities as a result of future open fire coke supply difficulties, has exercised most of the Divisional Councils during the spring and summer and, wherever possible, efforts have been made to assess the regional supply position of solid smokeless fuels.

There has been the usual trickle of inquiries regarding local pollution problems from many parts of the country at the Society's headquarters and in many cases the personal co-operation of divisional officers has led to action being taken. The Society would be greatly hampered in its efforts to serve the general public in this field were it not for the interest and zeal of the divisions, whose officers are able to combine these virtues with specialist local knowledge and a close relationship with the local authorities concerned.

On Thursday, September 5, the **North-West Division** met in Padiham Town Hall. Members were entertained to lunch by the Directors of Mullard's Simonstone. A tour of the factory followed.

Arrangements are being made for an important meeting to be held in Liverpool in October next, at which Dr. P. J. Lawther will be the principal speaker.

The **North-East Division** held its Annual General Meeting at Blyth Power Station on April 10 at the invitation of the North-Eastern Electricity Board. The 74 members present heard an address on "Electricity's Contribution to Clean Air" by the Station Superintendent, Mr. R. Lott. During question time the cost of

Members of the Yorkshire Divisional Council at the Coke Research Centre, at Chesterfield

Members of the South East Division at the Swanscombe works of the Associated Portland Cement Company

off-peak electricity and the disposal of obnoxious products of combustion arising from power stations were raised and adequately and concisely dealt with.

Prior to the meeting members were taken on a conducted tour of the power station which, when completed, will be one of the largest and most modern in Europe.

At its Meeting of June 27 the **Yorkshire Division** met in the library of the Coke Research Centre of the British Coke Research Association at Chesterfield. A discussion on the coke supply position was opened with contributions from Mr. K. E. Laycock, Area Coke Officer of the North-Eastern Gas Board and Mr. A. E. Bloomfield, Marketing Manager, Coal Products Division of the National Coal Board.

The members were entertained to lunch by the Association and its Director, Mr. G. W. Lee. An extensive tour of the Centre followed, special attention being paid to the research being undertaken in connection with the size, reactivity, performance and clean air virtues of domestic coke.

The **West Midlands Division** has been very concerned about the need to ensure the use of smoke density meters, records and charts. The spread of caravans in smoke control areas has been regarded as a development likely to impede clean air progress and the Division has undertaken considerable research on the extent of the problem in the West Midlands Area. At the Divisional Council Meeting on July 24 discussion reflected the concern felt by many members regarding solid smokeless fuel supplies.

The Park Foundry of Radiation Parkray Ltd., Belper, provided the venue for the Annual General Meeting of the **East Midlands Division** on July 11. Prior to the meeting members formed into parties and were shown the works, laboratory and showroom, at the foundry. In a speech of welcome, Mr. W. A. Ballard, Director and General Manager, expressed the view that in the future the supply of smokeless fuels will tend towards hard coke, most of which is supplied by the National Coal Board under the name of Sunbrite. Open-fire reactive cokes will be in relatively small supply hence the wisdom of developing the room heater with glass doors. His speech constituted a reasoned, unassailable case for this type of appliance qualifying for the grant.

A Brains Trust then answered questions on solid fuel appliances followed by the Annual General Meeting.

Mr. G. W. Dhenin addressed a meeting in the **South-West** on the Solid Smokeless Fuel position on July 31.

Inspecting a Parkray fire at the works of Radiation Parkray Ltd. at Belper—members of the East Midlands Division

The **South-Eastern Division** have organized a most useful series of eight visits for members. During the months of June, July, and September, parties have gone to the premises of the Gas Council (the Watson House Centre), the Associated Portland Cement Works at Swanscombe, the British Petroleum Refinery and Laboratory on the Isle of Grain, the Guinness Brewery at Park Royal, the Tate and Lyle Sugar Refinery at Silvertown, the British Railways Maintenance Depot, Stratford, London County Council Laboratories at the County Hall and the National Coal Board's Tilmanstone Colliery in Kent.

At all the premises visited members were conscious of enthusiasm and zeal where clean air and smoke prevention were concerned and at one installation the sole emission perceived was a discharge of ignited gas that existed solely to safeguard the safety and well-being of the personnel.

The Annual General Meeting was held on July 3 in the Library of the Royal Society of Health. At the conclusion of the business the Shell-Mex and B.P. film "Clean Air" was shown followed by the Laing production "The Berkeley Nuclear Power Station". It was announced that a 16 mm. print of the former film had been presented to the Division by Shell-Mex and B.P. Ltd.

ADVICE TO DIESEL OPERATORS

Firms operating commercial vehicles should list black smoke in the same category as faulty brakes and faulty steering, said Mr. J. R. Lemmer, group transport manager of Watney Mann Ltd., at a meeting at Isleworth on May 20.

Speaking to members of the Traders' Road Transport Association, Mr. Lemmer added: "Drivers should be instructed to telephone the depot immediately if smoke is emitted during a run, and not wait until they have returned to base. Only in this way can responsibility be properly shared between driver and owner".

Control of smoke emission and noise levels of vehicles is to be introduced on October 1, in the Republic of Ireland.

Binding "Smokeless Air"

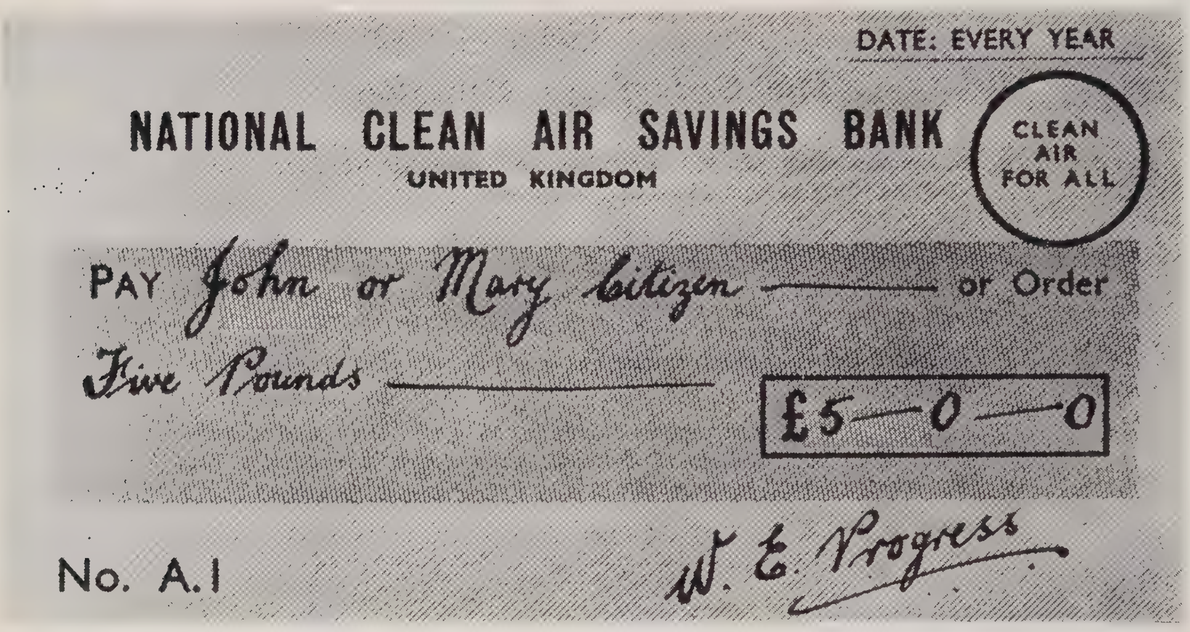
Readers who may wish to have their copies of this journal bound in volumes, but are uncertain of the cost, may like to know that this can be done in hard covers, with the title, etc., on the spine, for 8s. 6d. for one volume (four copies), 10s. 6d. for two years together, and 12s. 6d. for three years, postage extra. More details will be given on application, but please do not send journals to the Society.

New Publicity Material

Illustrated is the new poster issued by the Society for local overprinting. It is available in two sizes and is already selling well. Below, reduced a little, is the popular "give away" cheque (with acknowledgments to its Manchester originators), with the wording that appears on the reverse side.

Also now available is a new colour leaflet "Smoke Affects Your Wealth—Your Health", and a reprint of the article by Mary Stott which was reproduced from *The Guardian* in our last issue—"Why do we put up with it?"

Details of prices of these publications are given on page 13. The Society's new "do it yourself" display kit, comprising photographs, printed cards, etc., is now available and full details will be sent on request.



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The Government Committee which investigated the problem after the London smog of 1952 estimated the cost of air pollution to the nation as being at least £250,000,000 per year.

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Work out how much smoke has cost you and your family during your lifetime.

The wholly unnecessary discharge of grey, tarry and deadly smoke from the millions of domestic chimneys is undoubtedly the most serious aspect of the smoke evil.

AIR POLLUTION ABSTRACTS

681. Rate of Dust Emission from a Precipitator. Crawshaw, C. J. (The Engineer, June 28, 1963, 1149-1154). While it is a natural assumption that the amount of ash in the fuel supplied to a boiler has a direct bearing on the amount of emission from that boiler, it does not appear that any precise assessment of this relationship has hitherto been made. In view of the attention being paid by the Central Electricity Generating Board to the efficient maintenance of dust collectors to comply with the requirements of the Clean Air Act, it was thought that such information might be of value. A simple assessment of this relationship has therefore been made, taking all known variables into account, and it shows the importance of the ash content of the fuel in relation to other parameters affecting the emission rate. From the derived figures two charts have been constructed relating dust burden and emission at dust collector outlet to the ash content of the fuel for any dust collector efficiency, or alternatively, with adequate knowledge of the fuel characteristics, giving approximately the dust collector efficiency from the value of the dust burden obtained by test. The charts are of general application, the first to p.f.-fired boilers and the second to boilers other than p.f. fired, but they are strictly only true for the particular fuel on which the assessment has been based. To cater for other, different fuels, correction curves have been evaluated to relate the moisture content, the dry ash-free calorific value and the carbon content of the ash to the values used in compiling the chart, so enabling tests on which the fuel may vary, to be corrected to specific conditions, thus giving a more precise estimate of changes in the dust collector efficiency.

682. The Clean Air Act: A General Survey. Marsh, A. (J. Inst. Fuel, June, 1963, 254-258). This paper reviews the Clean Air Act, 1956, and, after discussing the reactions of industry and the general public, comments on the operation of the various sections, including the position with respect to industrial processes, and the progress made in the abolition of domestic smoke by the establishment of smoke control areas. It refers to the control of pollution from certain processes under the Alkali, etc., Works Regulations Act and Orders. It is concluded that the Act is making reasonably good progress in the prevention of industrial smoke, grit and dust, and that the domestic smoke programme is workable and acceptable, but is proceeding more slowly than had been hoped. The article concludes by discussing the next steps needed to promote clean air, among which are the abatement of road vehicle pollution, of sulphur dioxide, and other pollutants.

683. Domestic Solid Smokeless Fuel Appliances: Pointers to Improved Design. Moss, W. C. (J. Inst. Fuel, July, 1963, 275-280). The probable influence on appliance design of the trend from gas coke to hard cokes and to dense highly reactive smokeless fuels, especially on such things as firebox capacity and firebar spacing, is discussed. With convector open fires, the need to maintain efficiency without the threatened return to complicated fixing methods is stressed. High output back boilers need to be improved to match the high efficiencies of the more recent designs. Possible reasons for the failure of copper boilers are suggested, and future materials for boilers, bottom grates and firebricks are discussed. Developments in forced primary air and thermostatic control of open fires with high-output boilers are forecast. For stoves, and extension of the use of glass windows and a routine air-tightness test are suggested, as well as the thermostatic control of room temperature. The need for rationalizing British Standards to keep pace with new developments in boilers, for more realistic methods of rating, and for improved amenities such as mechanical ash removal, is pointed out.

684. Efficiency of Electrostatic Precipitators as Affected by the Properties and Combustion of Coal. Busby, T. H. G. and Darby, K. (J. Inst. Fuel, May, 1963, 184-197). The paper discussed the results of an investigation into the adverse performance of electrostatic precipitators on pulverized-fuel boilers firing certain coals from the U.K. and Australia. The effect of the electrical resistivity of the fly-ash is examined and it is shown that when the resistivity of dust exceeds about 10^{13} ohm/cm the efficiency of precipitation is reduced. The resistivity of the dust is determined by the surface condition of the dust particles and it is shown that the adverse effect when resistivity is high can be overcome by the injection of a few parts per million of sulphur trioxide into the flue before the precipitator, this being completely absorbed by the dust. The conclusion is drawn that the formation of sulphur trioxide from combustion of the sulphur in the coal is an over-riding factor in determining precipitator efficiency and this, while broadly related to sulphur content of coal, is also affected by unknown factors in the combustion process.

685. Calorimeter for Measuring the Performance of Room Heaters. Balfour, D. R. and Start, P. L. (J. Inst. Fuel, May, 1963, 198-200). A water-cooled box constructed from copper "tube in strip" sheet has been used to determine the efficiency of a closed stove by absorbing all convected and radiated heat. It is shown diagrammatically in Fig. 1. Fig. 2 shows a domestic heater in position in the calorimeter. A high water flow rate ensured that the time taken by the calorimeter to respond to a change in the heat output of the stove would be not more than five minutes. The stove was weighed at 30-minute periods. The rate of air flow to the stove was measured, and the flue gases were analysed. Improved versions of the calorimeter could be built, using more accurate weighing and measuring instruments, all of them automatic in operation. The calorimeter can be used to improve the design and performance of closed stoves.

686. Effect of Air Pollutants on Respiratory Infection. Ehrlich, R. (Arch. Environ. Health, May, 1963, **6**, 638-642). The effects of atmospheric pollutants on health frequently occur as a result of contact between the pollutants and membranous surfaces of the body. The nose, in addition to absorbing very small portions of inhaled gases also retains solid and liquid particles larger than 5μ. To date, ozone and nitrogen dioxide have been studied on mice in terms of their effect on the mortality due to respiratory infection. The results of experiments on the effects of NO_2 on resistance to respiratory infection are summarized. The exposure to NO_2 was kept constant at 25 ppm. for two hours. This exposure did not result in any deaths, although it produced varied degrees of congestion and dilation of veins and capillaries as determined by histopathological examination of the lungs. Additional studies on effects of various NO_2 concentrations on resistance to infection are currently being conducted. Corresponding data for ozone exposure are also shown for comparison.

687. Vehicle Smog Emissions. London, A. L. (Arch. of Environ. Health, May, 1963, **6**, 672-677). To date the major portion of engineering research and development effort concerned with the reduction of motor vehicle emissions has been on afterburners. The author considers two other approaches, both of which seem worthy of more emphasis than they are receiving. These are: (*a*) basic improvements in the design, production control, and maintenance of the carburettor and distribution system of the conventional spark-ignition (S.I.) four-stroke cycle automobile engine, and (*b*) a change of engine type to one having inherently the potential for low hydrocarbon emissions. Both approaches must relate directly to the chemistry of fuel oxidation within the engine. The basic chemical requirement for low hydrocarbons in the exhaust is close to complete oxidation of the fuel. This requires air-to-fuel ratios greater than 14 to one. The gas turbine engine, and stratified charge S.I. engine are discussed.

688. Compliance with the Clean Air Act: Medical Aspects. Lawther, P. J. (J. Inst. Fuel, August, 1963, 341-344). The implementation of the Clean Air Act will lead to the abolition of smoke but not of sulphur compounds. Smoke cannot be said to be good for people and by virtue of its carcinogenic nature may be very harmful. Its abolition therefore must be welcomed and hastened. The effects on man of sulphur dioxide and sulphuric acid in concentrations such as are found in town air are difficult to determine. Laboratory experiments with SO_2 have so far failed to produce measurable effects in concentrations less than 2 ppm. Experiments with realistic concentrations of sulphuric acid have been negative. Epidemiological (studies on large groups) investigations have shown that the prevalence of bronchitis is closely associated with air pollution and that mortality and morbidity varies closely with changes in smoke and SO_2. It is pointed out that SO_2 must still be regarded as an indicator of air pollution rather than a proved cause of disease. The question of synergistic action of SO_2 and "inert" particles is discussed. There is an overwhelming case for the abolition of any pollutant without awaiting the results of research.

689. The Changing Scene in Gas. Redman, M. (J. Inst. Fuel, August, 1963, 329-341). The economic and technical reasons which have led to the attractiveness of light liquid and gaseous petroleum hydrocarbons as feedstocks for the production of town gas in Britain are reviewed. The comparative disadvantages of coal and heavy oil products are examined both in relation to the fundamental chemical and physical nature of the changes arising in the gas-making process and in relation to capital and operating costs. New and proposed processes are described and assessed. The increasing cost of making solid smokeless fuels is noted. The influence of integration of gas production upon costs is studied in the light of manufacture and transmission at high pressure. The contributions of underground storage and the importation of natural gases are examined. Due to the high efficiency and low capital and operating costs of modern gas production processes, it is concluded that further significant economic improvements from the process aspect are unlikely and that any appreciable additional reduction in gas supply costs is likely to lie in the direction of direct sales of natural gas. It is concluded that such a regime must await the provision of large-scale natural gas supplies from diversified sources, but it is quite likely to come about.

690. Progress Review No. 53: Domestic Heating. Rowse, R. H. (J. Inst. Fuel, July, 1963, 280-285). The campaign for improved heating services is traced from 1945, when the Egerton Committee report was published, till the present day when the public is overwhelmed by a mass of competing claims by the fuel producing industries. Statistics show that arrangements for heating and hot water have not changed greatly since the war. The provision of improved heating is slowed down by the large number of rented houses in Britain and the reluctance of both tenants and landlords to install more advanced forms of heating. Full and partial central heating are becoming increasingly popular, but it is too early to analyse trends. Various sources of heat using different fuels are surveyed from the technical point of view—central boilers, conversion units, air heaters and individual living room heaters. Distribution of heat by hot water and warm air are described and the most important technical contribution to the improvement in domestic heating over the past few years is considered to have been the development of the small pipe central-heating system. The importance is being increasingly appreciated by the fuel industries and by appliance makers of providing good advisory and after-sales service. With regard to the Clean Air Act, the primary problem in the establishment of a smokeless zone is the correct psychological approach to the residents in the area.

691. Corrosion and the Clean Air Act. Turner, T. Henry (The Engineer, August 2, 1963, 192). Metal corrosion depends as much on the surrounding air as upon the properties of the materials used. Reference is made to an important paper by W. E. Bardgett and J. F. Stanners, "The Delhi Pillar", which provides evidence for this contention. The author's own experiences date from the 1930's when he established corrosion test stations in the East End of London and in other polluted areas of the country. Ten years later, when he commenced to test atmospheric pollution as well, he was able to show proper connection between metal losses due to corrosion and the nature and intensities of air pollution. Since the passing of the Clean Air Act and the growth of smoke control areas in the past seven years, with the consequent decrease of tar and grit, the nature and intensity at several of the old established corrosion test stations are in process of being changed. As expenditure in industry due to corrosion has been assessed as £400 million per annum, there is much need for some engineers to specialize as corrosion engineers. Reference is made to various scientific bodies which have made field tests of corrosion and also to publications devoted to corrosion prevention.

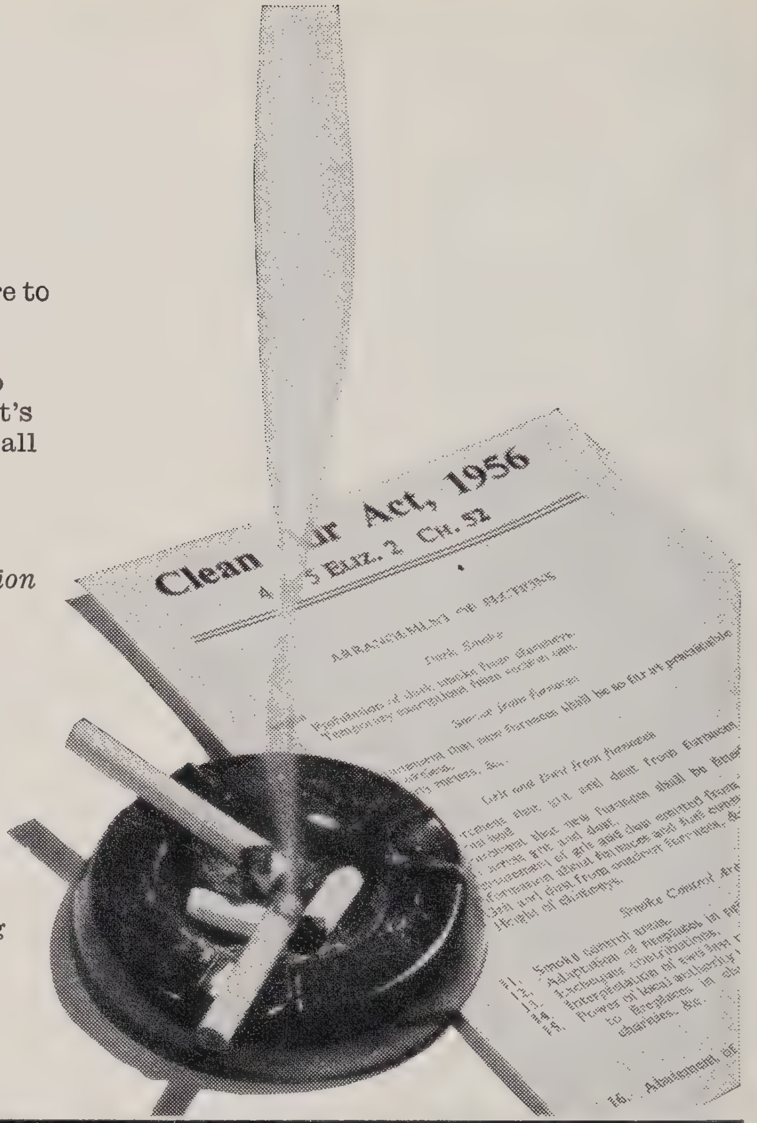
Coke and Industrial Development was the title of an article by Dr. Albert Parker, the President of the N.S.C.A., published in *Chemistry and Industry* for June 1, 1963.

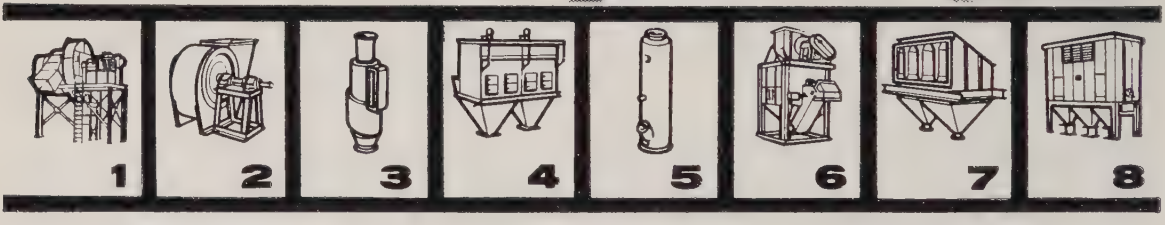
“What do you mean—everyone’s getting into the Act?”

“I mean the Clean Air Act is here to stay. Every bit of combustion equipment manufactured and erected *now* must be designed to comply with the law—whether it’s in a smokeless zone or not—and all existing equipment will need to comply by 1963.”

“I think it’s a good thing because, apart from the atmospheric pollution it’s making people think—about efficient combustion. That’s why I say we should get in touch with Keith Blackman. They have a complete range . . . mechanical draught fans, dust collectors, combined induced draught and grit arresting fans . . . the answer to practically every problem inherent in the Act.”

“Well, they should know a thing or two. They’ve been at it for three quarters of a century—long before the Clean Air Act was even heard of.”





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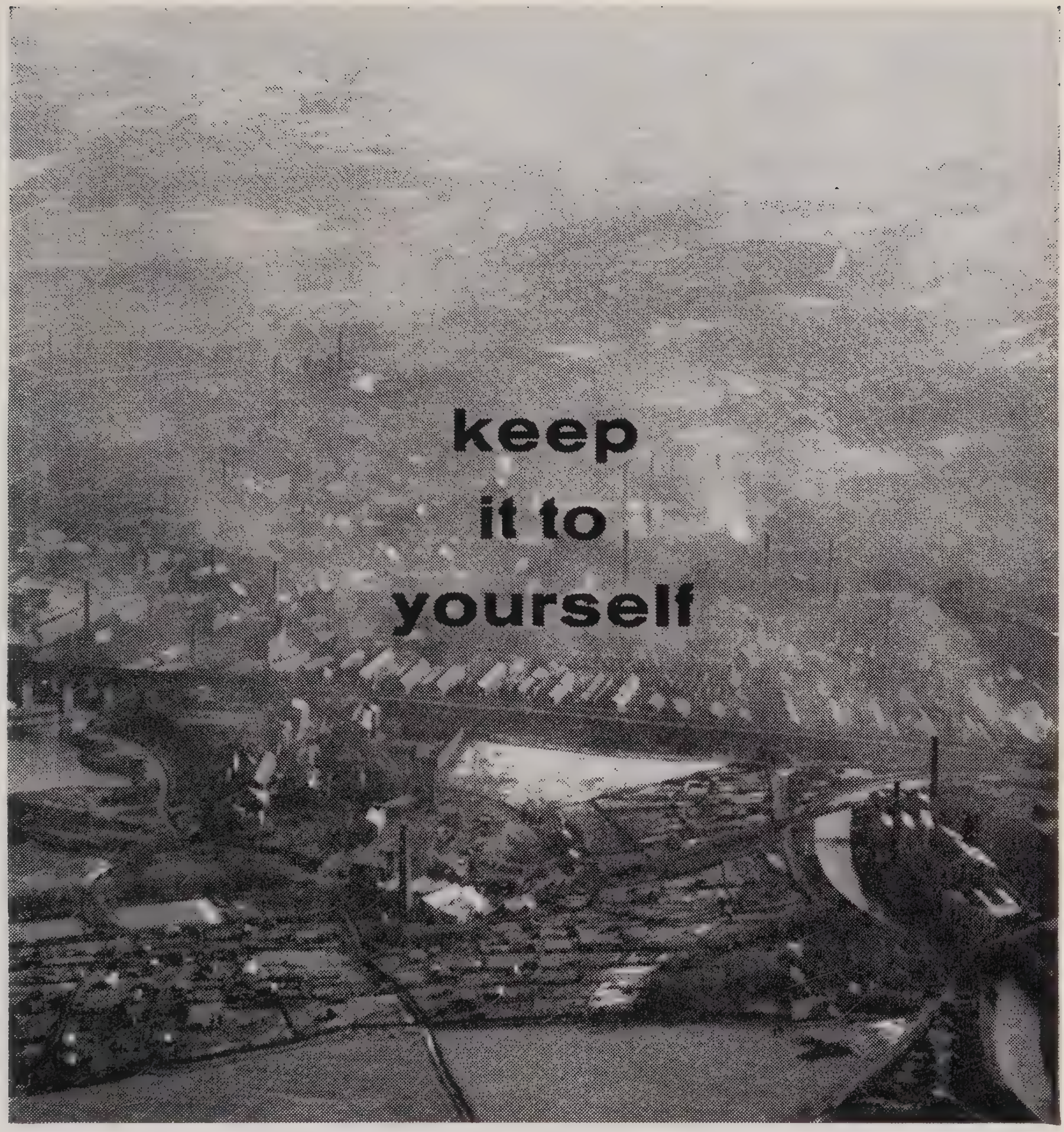

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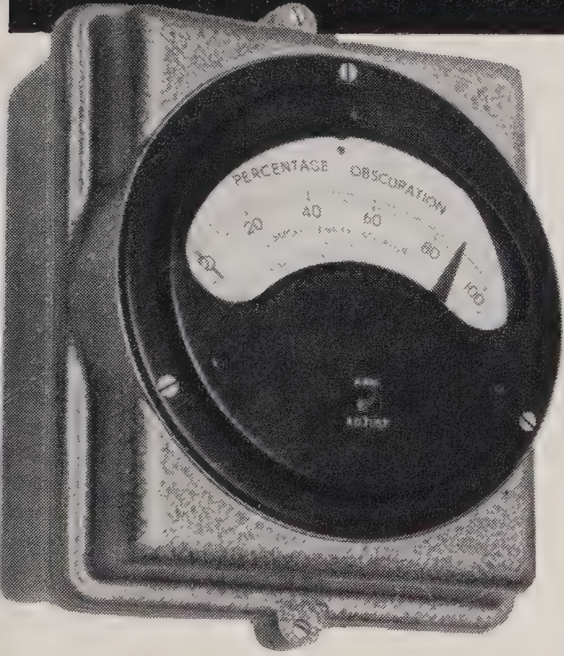

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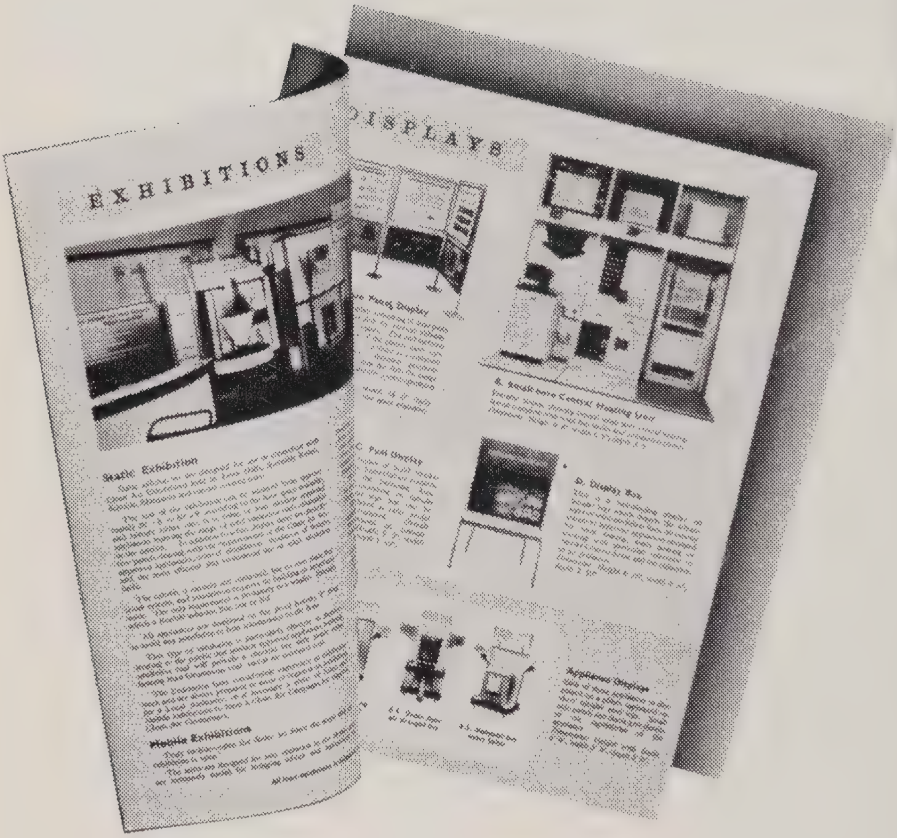
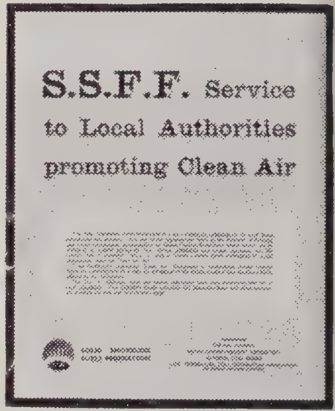
Service to Local Authorities promoting Clean Air



Local Authorities organising "Clean Air" campaigns or establishing Smoke Control Areas are cordially invited to take full advantage of the technical advice and assistance freely offered by the Solid Smokeless Fuels Federation. The Federation is always prepared to assist or organise an exhibition, or if required a series of static and mobile exhibitions to form a "Clean Air" campaign for regional Clean Air committees. Services of this kind have been provided for Local Authorities up and down the country.



S.S.F.F. Service to Local Authorities promoting Clean Air

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describes and illustrates the services and exhibition material all of which are available free of any charge.

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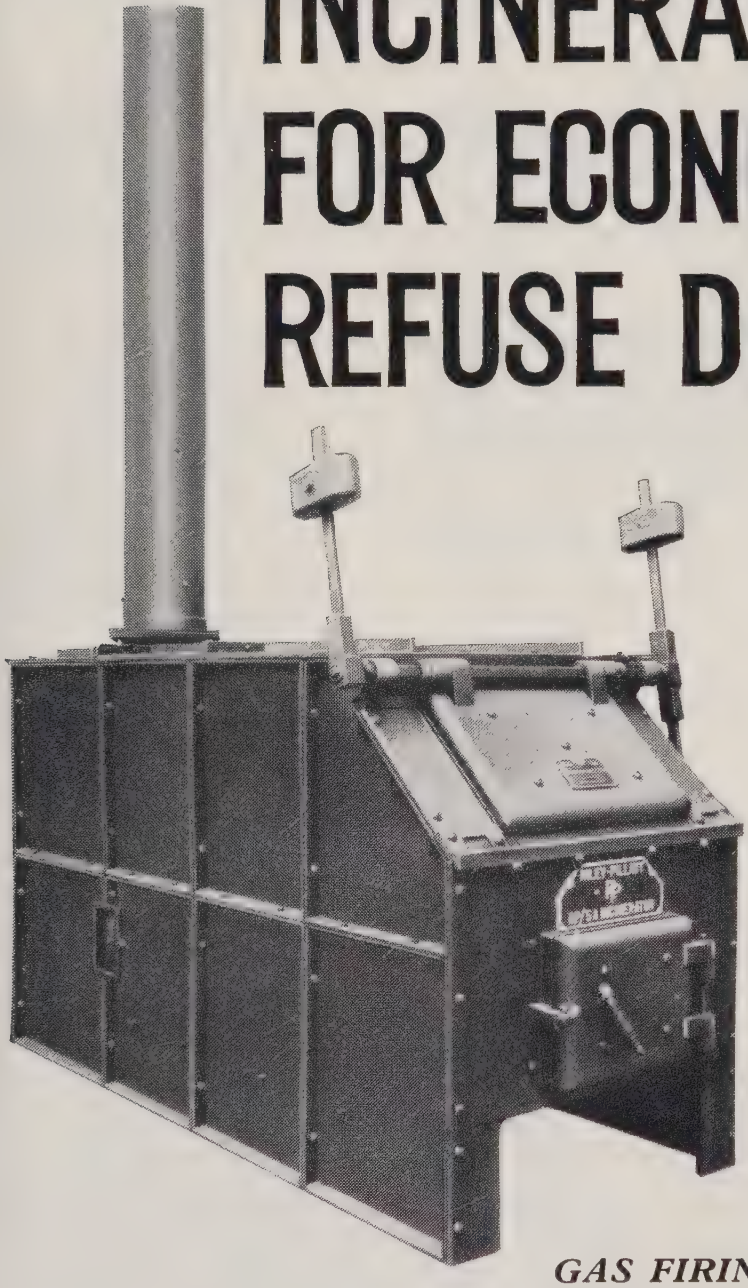

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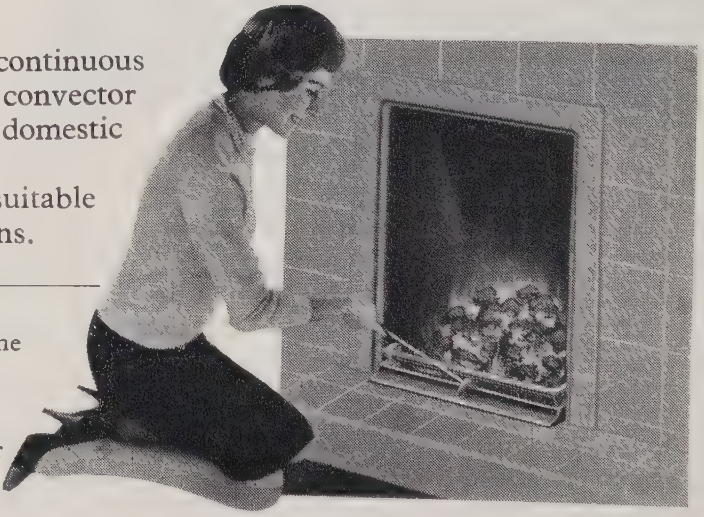

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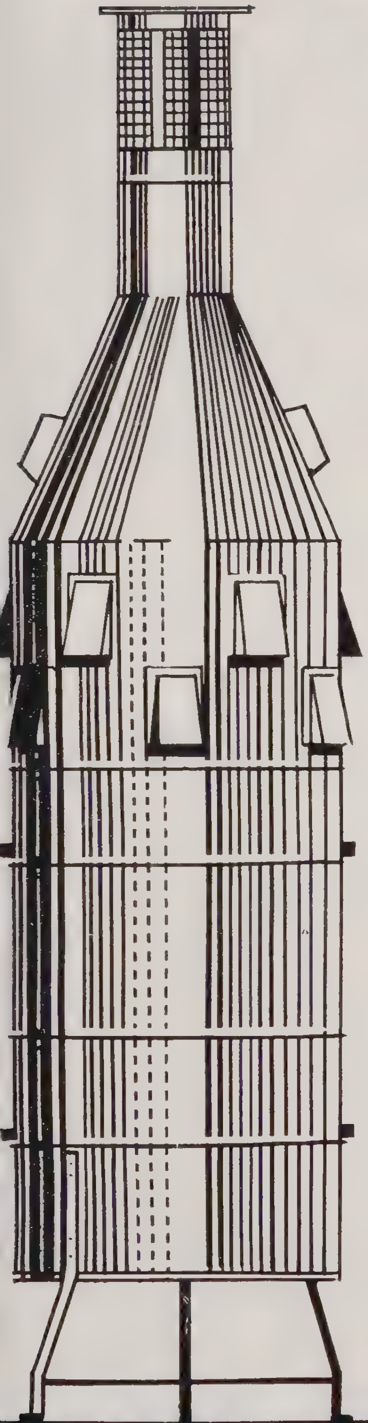

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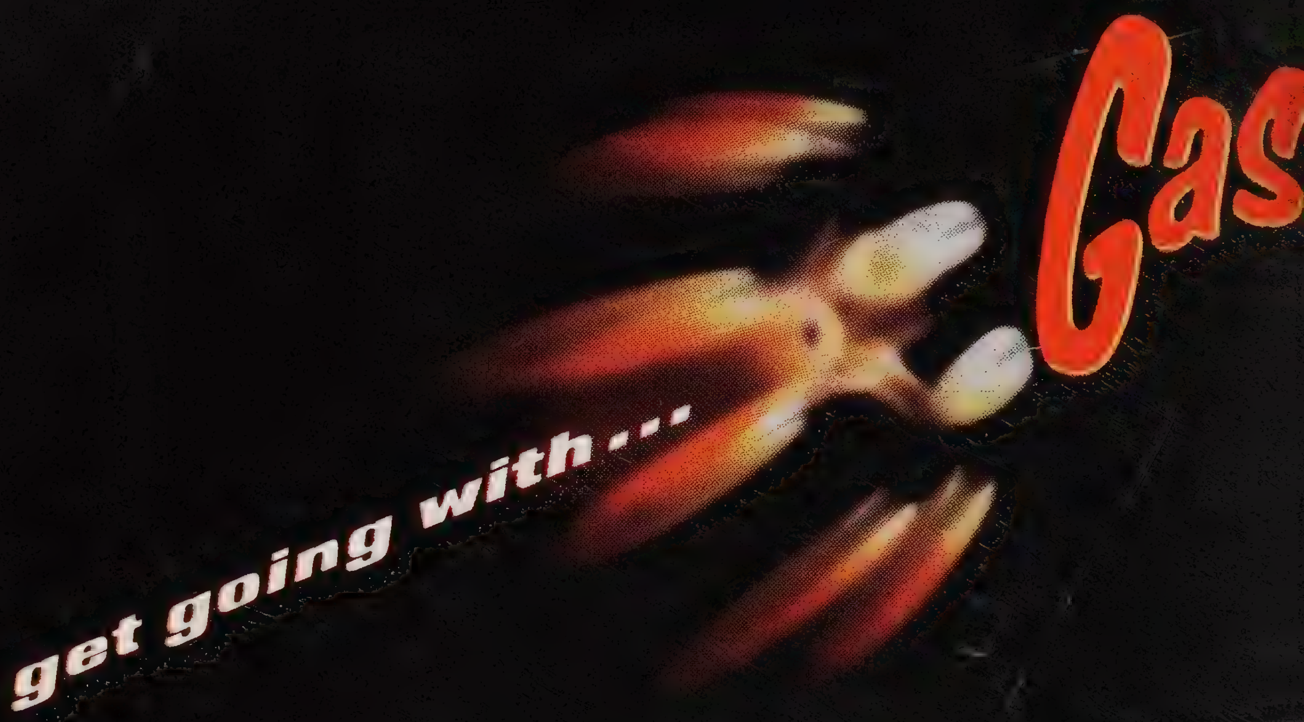

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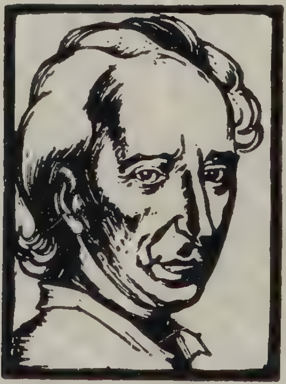

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Circular to the North West ✶ Amendments to the Clean Air Act
J. J. Matthews and F. J. Redstone ✶ Lord Hastings at Scarborough
Air Pollution: the Human Problem ✶ A.P.H.I. Report on Smoke Control ✶ International News

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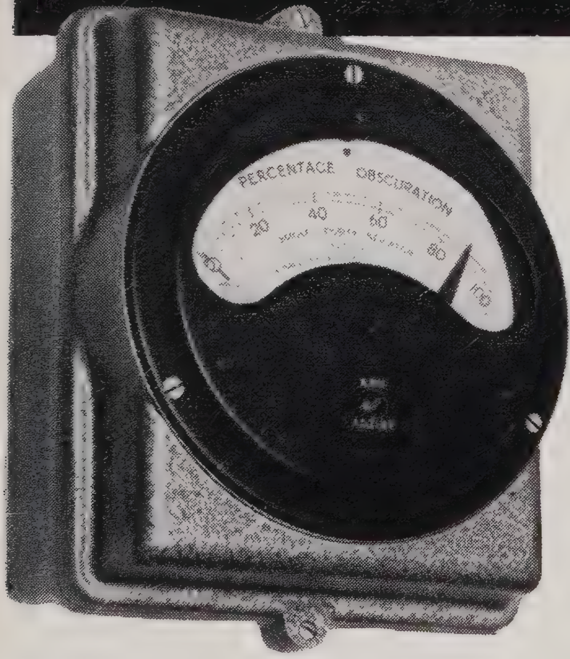

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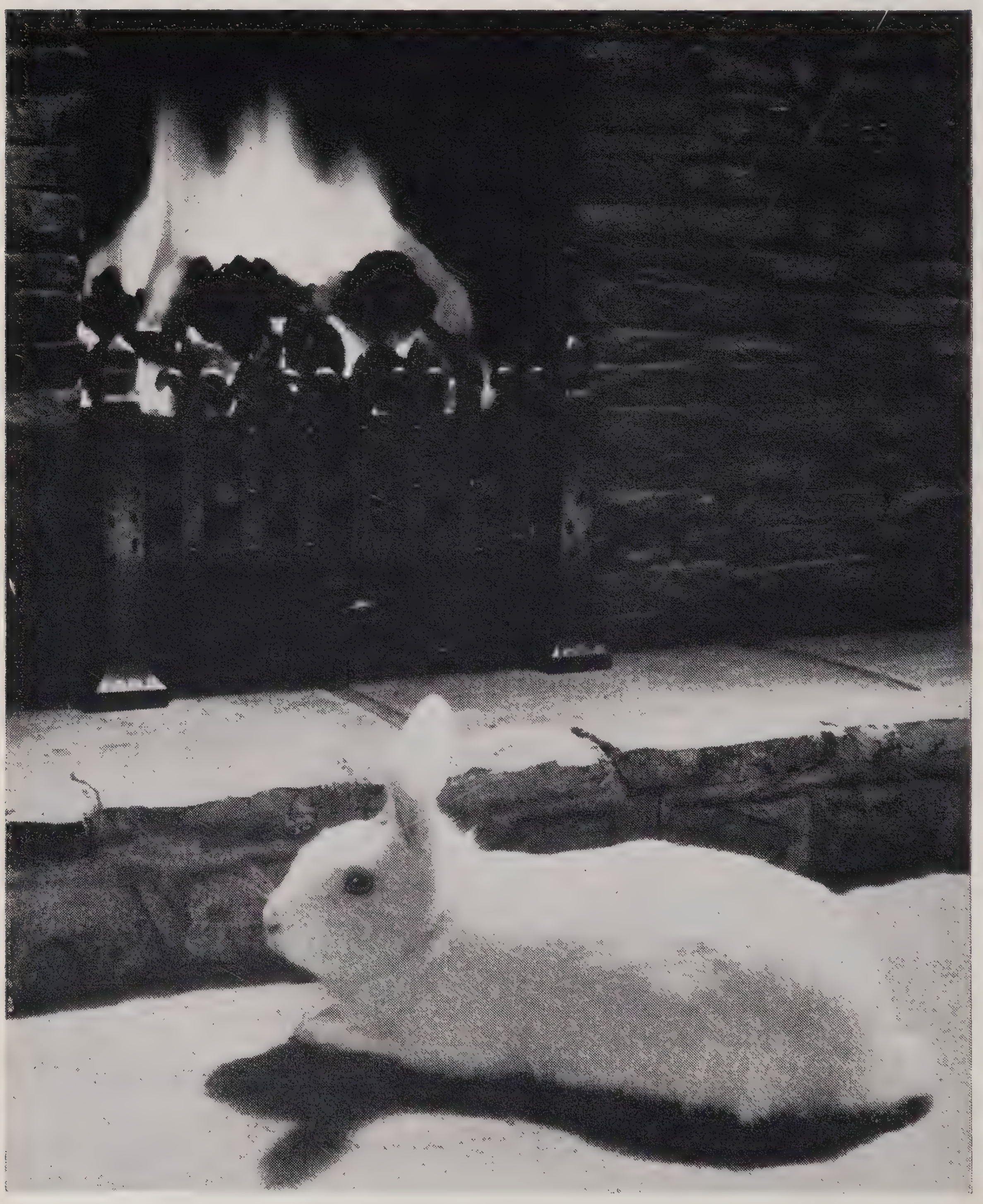

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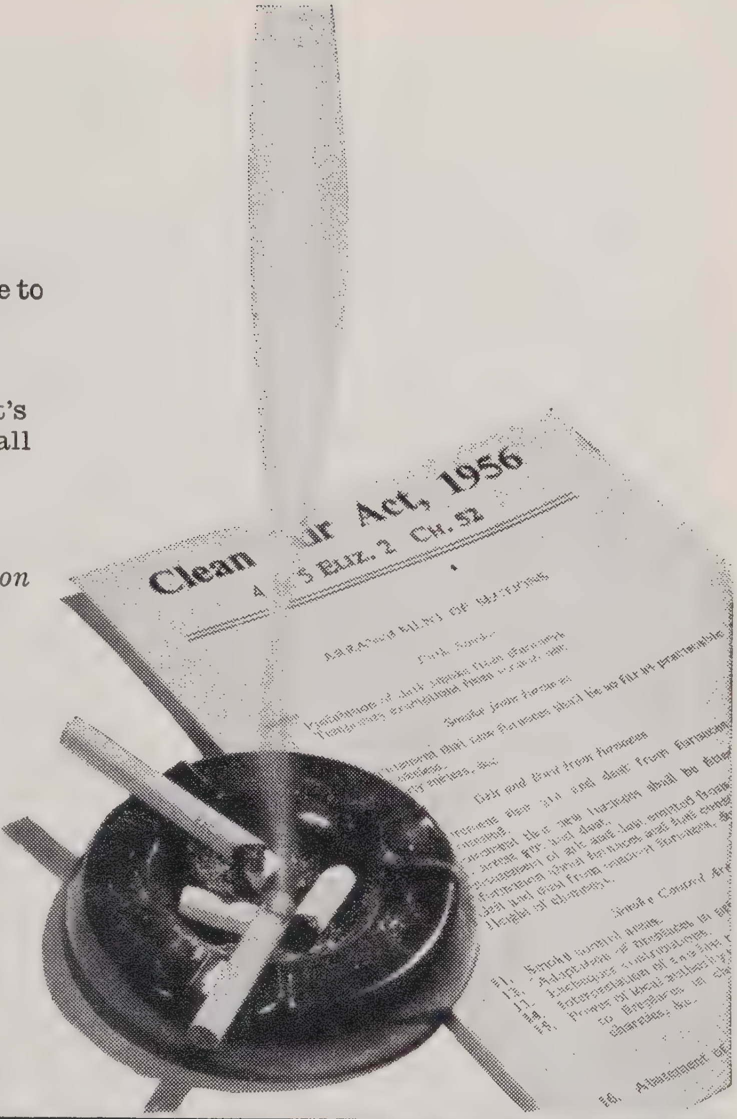

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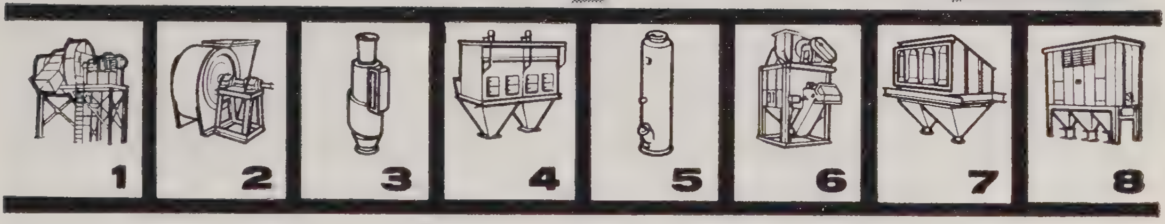

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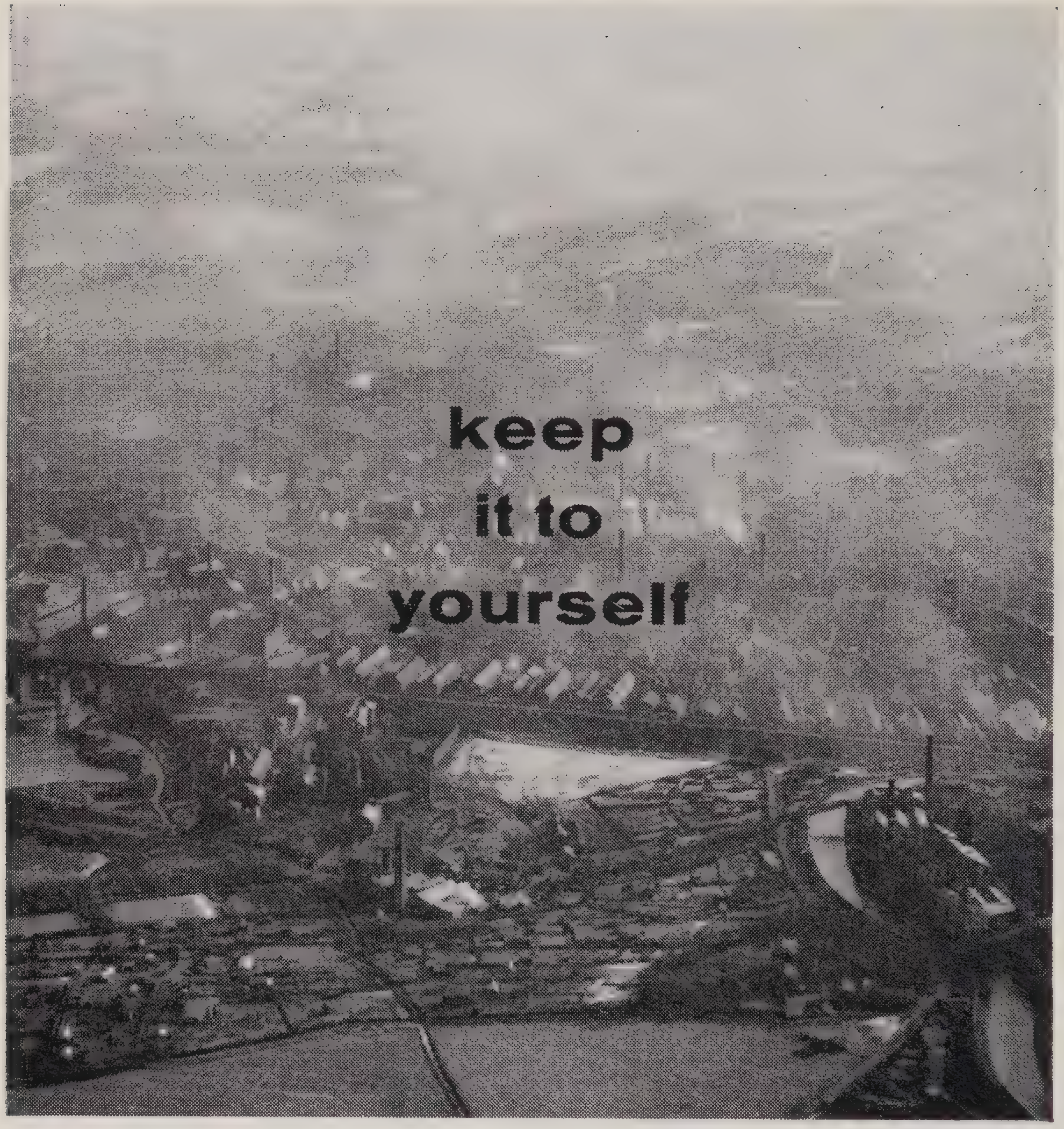

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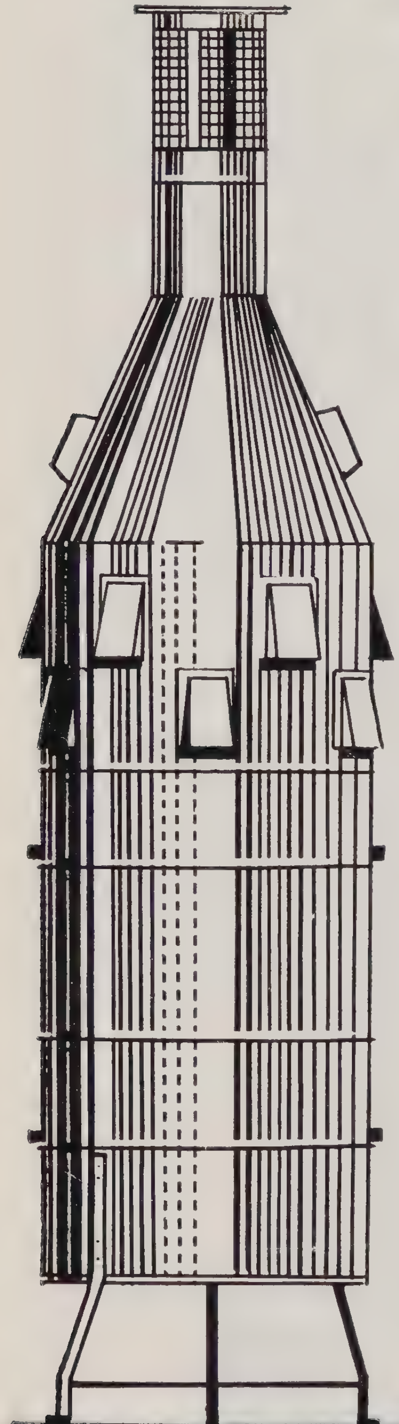

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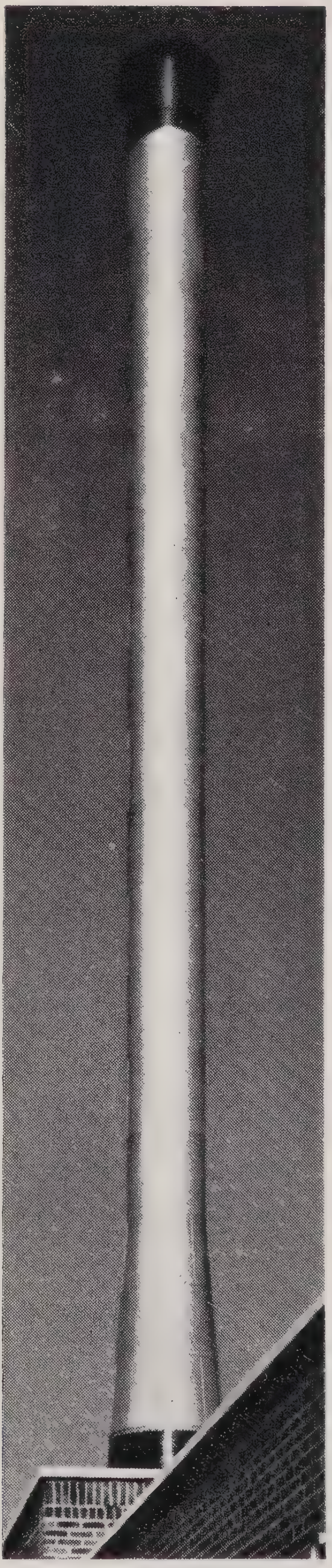

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Vol. XXXIV No. 128 Winter 1963

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All bright and glittering in the smokeless air.

SMOKELESS AIR

Smoke Control in the Future

THE anxiously awaited statement from the Minister of Housing and Local Government, on the new regime for the smoke control area programme, had not been published by the time this issue had to go to press, although it may have done so by the time it falls through the letter boxes of our readers. It is one of the trials of a quarterly publication that important things happen at the wrong time, creating a delay of three months or more before they can be reported and discussed. Last December it was not a Ministerial pronouncement but the London smog that occurred most inconveniently.

We are therefore still unable, just as the Scarborough conference was, to review and report the new situation with any certainty of what the inter-departmental study of the fuel situation is going to report, and still less what the Minister proposes to do about it. The main problem is however quite clear, and the shape of things to come may be surmised from the terms of the circular letter to local authorities in the north west that we record on another page. It is that conversions from open coal fires to open improved fires in new smoke control areas will either be discouraged or grants for them vetoed, and that those who continue to prefer solid fuels and wish to claim grant will have to install openable room heaters (*né* stoves) instead.

There cannot of course be any question of preventing householders who prefer an open fire from continuing to use their existing one (with the more reactive fuels) or putting in an improved one at their own expense. It is an interesting point that in some cases it may be cheaper for them to do this than pay their three-tenths towards the cost of a room heater—even though they will find the latter cheaper in the long run.

It is on this question of cost that there are likely to be difficulties and perhaps a slow-down in progress. The room heater is becoming steadily more popular, and the breakthrough we need is probably held back merely because these more efficient appliances cost so much more than the simple open fires. Any general reduction in prices, now that a mass market is in sight, would earn the manufacturers the gratitude of the clean air movement.

As things are, or will be, the three parties concerned in paying for smoke control conversions—the householder, the local authority, and the Exchequer—will all have to pay more (unless we find that the Exchequer is prepared to increase substantially its own share). This is bound to increase resistance to smoke control from both householders and from many members of local authorities who are inclined to think first about the rates.

The *means* for continuing to make steady progress with smoke control, and perhaps even to improve upon progress to date, are reasonably good. Gas coke and Gloco are not going to disappear overnight; there will be increased production of the premium smokeless fuels; gas, with the economies it hopes to achieve in production and the new appliances that have become so popular, can and will take a much bigger load; and, using off-peak methods, so can electricity. Oil, too, may play a bigger part.

Because of the importance of some of its findings to the smoke control area situation we are reporting in full, in this issue, the report of an inquiry made by the association of Public Health Inspectors. This gives further proof of the significant trends towards gas and electricity which, as they continue (which seems certain) will radically alter the pattern and may in fact largely solve the present problem. Attention may also be drawn to observations quoted in our reviews of the annual reports of the gas and electricity industries.

In short, there is less to be anxious about on the score of availability of suitable alternatives to open fire coke than there is to securing acceptance of the fact that they are all going to cost rather more to install. The task will be to convince householders and the local authorities alike that, in terms of benefits to be gained, smoke control continues to be both necessary on social grounds and good business on economic grounds. It has never been easy to do this, either with members of councils or the public at large, but it now becomes more important and it is a job in which the N.S.C.A. must do everything it can.

Obligatory Smoke Control

Our Chairman, Dr. J. L. Burn, took part a few months ago in a radio programme in which he was questioned by the audience in a Lancashire town on clean air matters. It was a live audience in every sense, typically Lancastrian in its direct and outspoken approach, and many of the questions were very much to the point. A general sympathy for clean air measures was evident and, as the broadcast was from a mining area, most encouraging. Of particular interest was the pressing of a question that asked why local authorities should be allowed to do nothing about smoke control, to the disadvantage of neighbouring authorities who were. Why should smoke control not be made obligatory in all areas? It is not a new question for those in the movement, and it is not the appropriate moment to raise it, but it is of interest to find it coming up spontaneously from members of the public.

Road Pollution

Those concerned with the pollution on our roads, from the Ministry of Transport onwards, have been frequently chided for our backwardness in not following the Americans in using the devices for removing fumes from vehicle exhausts, of which such glowing accounts have been coming across the Atlantic for years. The truth is that nothing really satisfactory and efficient has yet been marketed, and even California seemed to be taking a long time to test and approve devices that would make it possible to implement its law requiring their use. Now we read that the scheme is to be scrapped because the cost is too great. It was estimated, when the programme of testing was started in 1960, that a suitable device would cost about £18 per vehicle. Now it turns out to be about £70.

Over here, as far as diesel pollution is concerned, we are gratified that the Ministry is continuing its nationwide spot checks, the latest one, on September 18, is reported on another page, together with the resolution passed at the Scarborough conference. The method, which the Society proposed to the Ministry in 1961, seems to be effective and we hope it will continue and be extended.

Cancer from the Roads

Although many suspicions have been voiced, there has never been any proof of a relationship between lung cancer and pollution either from petrol or diesel exhausts. Now comes a report (*Medical News*, November 1, 1963) from the air pollution control division at Toronto, to the effect that the cancer rate among drivers goes up with mileage, and that it is twice as frequent among persons who drive more than 12,000 miles a year than among those who drive less.

If this is so the reasons must be sought. Is it through the pollution of the air within the vehicle, or in the ambient road atmosphere, or might it be influenced by the fact that the more one drives the less one walks and exercises the respiratory system?

Space Travel and Air Pollution

How serious a threat to clean air is the possibility of greatly increased space travel in the immediate future and, what is more important, how is such a global or international problem to be confronted by a clean air movement fragmented into small national groups and without representation in many parts of the World? Electronic experts have already predicted that it could lead to interference with radio communications and astronomy by distorting the radio mirror of the ionosphere and intensifying air glow, a little understood radiance in the night sky which at present is practically undetectable except with special instruments.

The booster rockets at present used to lift a space capsule on the first stage of its journey into space are quite enormous and consume vast quantities of liquid fuel in their vertical take-off. The tendency to increase the dimensions of space capsules means a proportional increase in the size of booster rockets and it is quite certain that the capsules being designed to carry crews and technicians on some of the exploits planned for the future will need boosters of truly gargantuan proportions.

Joseph L. Mylor, writing from Washington has recently visualized spacecraft engaged in these exploits circling in orbit every hour or so before their departure to the Moon or Jupiter on regularly scheduled flights. Before dismissing such prophecy as over-imaginative we should look at the progress made to date and the obvious enthusiasm of America and Russia to intensify their efforts in this sphere.

Earth's atmosphere is immense, as we all realize when faced with the discharge of pollutants that goes on daily, but the higher one climbs above the Earth the thinner the atmosphere becomes, hence gaseous material discharged at great altitudes fills much more space than it would at sea-level. At a height of 60 miles the atmospheric pressure is one millionth what it is at sea-level. At 80 miles it is one thousand millionth. This means that a ton of gaseous pollutant—rocket fumes for example would fill one billion times the volume it would occupy at sea-level.

The exact extent of the pollution from near-ground level in the case of booster rockets and in the stratosphere in the case of the capsules is a matter for conjecture and there will be many who will dismiss the problems as one of no immediate significance or relevance. However its potentialities cannot be ignored and it poses a problem that can only be confronted on an international level. It is certainly something deserving of full discussion when an International Union for Clean Air eventually comes to fruition.

Ministry Circular to the North West

Smoke Control Orders

Following is the text of a circular letter, dated October 11, 1963, *from the Ministry of Housing and Local Government to local authorities in the North Western Region.*

1. I am directed by the Minister of Housing and Local Government to refer to the Department's circular letter of May 28, which drew attention to the statement he made on May 24 about technological changes in the gas industry and their implications for smoke control. As the statement made clear, it was the effect of these technological changes on the future availability of supplies of solid smokeless fuels for use in open grates which called for a review of the current arrangements under the Clean Air Act.

2. This general review continues, and it is hoped shortly to inform local authorities of the progress made and the conclusions reached.

3. Meanwhile the probable future availability of smokeless fuels in the North Western Region has been reviewed. The first point which should be emphasised is that there will continue to be available supplies of solid smokeless fuels for use in improved open grates sufficient to meet the needs of all those who live in areas where smoke control orders or smokeless zone orders are already in operation and in areas covered by smoke control orders already confirmed by the Minister, but not yet in operation. If the public in these areas are in any doubt about this, local authorities are invited to reassure them.

4. The review, which covered the possibility of importing fuels from other regions, has shown that in the North Western Region there will not be sufficient supplies of solid smokeless fuel for use in improved open grates to meet the increase in demand which the local authorities estimate will result from new smoke control orders now before the Minister, or soon to be submitted. There will not however be an overall shortage of smokeless fuels since supplies of solid fuels for closed stoves and under floor draught grates and of off-peak electricity, gas and oil should be adequate to meet any gaps in the availability of open grate fuels. In recent years electricity, particularly when used at off-peak rates, gas and oil have become more competitive in running costs as compared with the solid smokeless fuels for open grates.

5. In particular there are abundant supplies of hard coke, suitable for use in closed and openable stoves and in under floor draught open grates. Hard coke is cheaper to use than the solid smokeless fuels for use in improved open grates and householders should be encouraged to choose it. It is marketed under the name of "Sunbrite". Accordingly, with immediate effect the revised grant arrangements set out in the Appendix to this letter will apply throughout the North Western Region in respect of appliances designed to burn hard coke.

6. The Minister therefore suggests that local authorities in the North Western Region who have submitted smoke control orders that now await his confirmation should review the fuel estimates and estimates of cost submitted with these orders in consultation with the local representatives of the fuel and power industries and with the householders affected by the orders, with a view to reducing as far as possible the demand for solid smokeless fuel for use in improved open grates and replacing it by a demand for alternative smokeless fuels. In areas covered by orders which have been confirmed but have not yet become operative the Minister suggests that the local authorities in conjunction with the fuel and power industries should do their best to ensure that domestic conversions not yet affected should as far as possible be conversions to the alternative fuels. It is hoped that this review will lead to savings in solid smokeless fuel for use in improved open grates which could be used in areas covered by further orders. The fuel and power industries have been informed by the Minister of Power of these suggestions and have been invited to co-operate with local authorities for these purposes.

7. When local authorities have completed their reviews, they are invited to submit to the Minister their revised estimates of fuel requirements and the fuel industries' offers to supply, together with their revised estimates of costs.

8. Without prejudice to the upshot of the review referred to in paragraph 2 above, the Minister suggests that for the time

being local authorities in the North Western Region should prepare any further orders on the assumption that they will need to be based upon the use of smokeless fuels other than solid smokeless fuels suitable for use in improved open grates (except in cases where firm offers to supply open grate fuels are made by local producers and suppliers). Local authorities who have received clearance from the Regional Fuel Advisory Committee for orders which they are preparing and have not yet made are asked to review their proposals on the same basis.

9. Local authorities preparing new housing schemes in areas covered, or likely to be covered, by smoke control orders will recognize that it is in their own interests to install at the beginning heating and cooking appliances for which adequate supplies of fuel are likely to be available. Advice on suitable appliances can be obtained from the fuel advisory bodies.

10. This letter is being addressed to all local authorities in the North Western Region.

APPENDIX

1. Under section 14(1) of the Clean Air Act 1956 only such works of adaptation are eligible for grant as are "reasonably necessary" to make suitable provision for smokeless heating and cooking in smoke control areas. In view of their greater initial cost stoves are not normally to be regarded as "reasonably necessary" solid fuel replacements for existing open fires. If they are installed grant is normally calculated on the notional cost of simpler replacements, such as open fires designed for smokeless fuels.

2. Section 34(6) of the Act however provides that in considering what works are "reasonably necessary" regard should be had to any difficulty in obtaining fuels which would have to be used if the works were not executed.

3. It is now in the interests of the clean air drive to remove any obstacles to the use of hard coke as an alternative to other solid smokeless fuels in the North Western Region. The Minister will therefore in future, for the purposes of grant under the Clean Air Act, treat the replacement of existing appliances by closed and openable stoves as "reasonably necessary" in the North Western Region. The same will apply to any other type of appliance described as suitable for hard coke in the current List of Approved Domestic Solid Fuel Appliances published jointly by the Coal Utilization Council and the Solid Smokeless Fuels Federation. Reasonable regard for economy will of course still be required and the conditions of grant set out in the Department's Memorandum on smoke control areas must be observed. Under paragraph 26(8) of the Memorandum, as revised in Annex C of Circular No. 3/62 it is a principle that reasonable freedom of choice should be given to the owner or occupier as between solid fuel, gas, electric or oil burning appliances provided that the total costs are broadly comparable in each case. This principle will continue to apply, provided that fuel for the appliance of the owner or occupier's choice is expected to be available. Local authorities in the North Western Region who are in any doubt how the principle should be interpreted in any particular case in present circumstances are invited to consult the Minister's officers, pending the subsequent issue of more detailed general guidance on this point.

LETTER FROM THE NORTH WEST

The Editor,
Smokeless Air

Sir:

Local authorities in the North West have now had time to study the Ministry of Housing and Local Government's letter dated October 11, 1963, making further smoke control orders dependent on supplies of hard coke. Having bombarded the Ministry with telephone calls and letters asking for clarifications of many points of detail, we are now sitting back awaiting the replies before taking further action.

The first reaction, one of dismay and anger at the sudden alteration of policy when the changing picture of the national fuel situation should have been obvious over the past few years, has changed to one of frustration. The many warnings, including that in the Beaver Committee's Report in 1954 appear to have been ignored until a desperate situation arose.

A few Councils who were not really keen have taken the opportunity to slide out. The enthusiasts who have already many houses covered by existing orders, whilst congratulating themselves on having saved a good deal of money, are worried by the problems of distribution of open fire coke. Who is to guarantee that Phimax, Gas Coke, etc., will be directed to existing smoke control areas? What about the houses built after 1956, where improved open grates have been installed in compliance with building bye-laws?

Still on the question of supplies of smokeless fuel; Paragraph 7 of the Minister's letter appears to transfer from the Ministry of Power to local authorities, the duty of ascertaining whether supplies of fuel for each particular order are available. On the basis that only a fool makes the same mistake twice, reassurance is required on the continuing adequate supplies of hard coke. Lord Robens has declared that there are millions of tons of this fuel available at the present time, but was this not once the position with gas coke? What, therefore, are the yearly production figures of Sunbrite? Will these increase, remain stationary or decrease?

The present letter appears to have been hurriedly sent out before the full story of the national fuel situation is available, presumably to try to reduce delays in the confirmation of smoke control orders at present with the Ministry. Yet the ambiguity of the letter, and in particular the appendix, means further delay whilst local authorities seek guidance. Surely as the same problems had already been faced in the North East, a detailed explanation of approved costs of conversion of closed stoves, etc., could have been sent out at the same time. Without this, no consultation with householders is practicable. The first question is always "how much will I be allowed?".

Costs of conversion are estimated to go up by 3 to 10 times, depending on the appliance selected, and for many Councils this will be the great stumbling block. It is generally thought that in addition to the authorities who call a halt to their smoke control programmes, many more will be forced to slow down because of these heavy additional costs. They are, therefore, looking to the Government for increased financial assistance.

Yours, etc.,

RONALD J. STANYARD,
Hon. Sec., N.W. Division,
N.S.C.A.

Denton, Manchester.

Stop Press

AMENDMENTS TO CLEAN AIR ACT

As we go to press the Government's Housing Bill has been published. It includes amendments to the smoke control area provisions of the Clean Air Act 1956 which presumably will be required to implement the new policy to be announced by the Minister. The principal feature of the proposed amendments (in Clause 90) is that in new dwellings conversion grants will not be payable for an appliance that, in the opinion of a local authority for its own area, or the Minister for the country as a whole, tends "by reason of its consumption of fuel (of whatever kind) or its consumption thereof at times when it is generally used to impose undue strain on the fuel resources available".

This would apply to open fires in areas where open fire coke is, or will be, in insufficient supply, and to electric heating not using the night load. There are several amendments relating to the approval and payment of grants. The "works" which qualify for grant are now specifically stated to include the provision of gas, electric or other ignition, and for this purpose "works" means the provision of the apparatus, whether fixed or not.

The Clause is being considered by the Parliamentary and Local Government Committee of the Society, which will be pleased to receive any observations from members of the Society. The Bill is obtainable from H.M.S.O. at 8s., and duplicated copies of Clause 90 may be obtained from the Society on request.

J. J. MATTHEWS and F. J. REDSTONE

It is with deep regret that we have to record the deaths, within a month of each other, of two of the most loyal and valued members of the Society's Executive Council: John J. Matthews, Hon. Secretary of the South East Division since its formation in 1953 and until recently Chairman of the Conference Committee; and Frederick J. Redstone, Chairman of the Executive Council from 1955 to 1957. Mr. Redstone had been a member of the Council since 1943, and Mr. Matthews since 1945. Both had been a source of unfailing support and understanding of the work and needs of the Society, and both had the high respect and affection of all who knew them, members of the Society, of the Council, and of the staff, alike.

J. J. Matthews, who died on September 15, at the age of 67, was for many years the Chief Public Health Inspector for the Borough of Acton, and was an authority on many aspects of environmental health and hygiene. In his earlier days he had been well-known in the football world as a leading referee. He had an unflagging devotion to the Society, as shown by his thirteen years (a record) as Chairman of the Conference Committee, and by his success as the Hon. Secretary of the South East Division. The vigour and enterprise of the Division has been very largely due to his personal enthusiasm, drive and imagination. On the Conference Committee he was a chairman whose strength lay in his patience, fairness and unobtrusive firmness. In the work of organizing the conference, growing as it has done from year to year, he was always ready to discuss, advise and decide on problems as they arose, and then backing up and helping the staff to the full.

John J. Matthews

Fred J. Redstone

Fred Redstone, aged 57, was taken ill during the Society's conference at Scarborough in October, and died in hospital there the following week. He had been Chief Public Health Inspector for the City of Bristol for twenty years, having joined the staff of the health department as a district inspector in 1929. He was an authority on housing and slum clearance, and was keenly concerned with the problems of air pollution. In addition to his many years on the Council of the Society he was Hon. Secretary of the Bristol and West Clean Air Committee—an advisory committee of local authorities which, though not a Division, has always had most friendly relations with the N.S.C.A.

Mr. Redstone gave sterling service to the Executive Council, and helped in many ways in the problems and the achievements it has experienced during the years of growth since the war. His term as Chairman was highly successful, aided by his wisdom, tolerance and sense of humour. He was deputy to, and then succeeded, Dr. W. R. Martine in the chair, and in a letter of appreciation Dr. Martine writes:

"I cannot think of any advocate of clean air who has done more in the post-war years than Fred Redstone and, speaking personally, I shall always remember the unfailing support he gave me during my two years in the chair and at the time of the emergence of the Clean Air Act. He will be greatly missed now in his role as Elder Statesman in the Society and also in the wider sphere of general public health. Sincere in anything he said he was always one to think of the team, hence his popularity with everyone. There are few P.H.I.s who have done more to cement good relations between the P.H.I. and the M.O.H."

DIESEL SMOKE

A statement issued by the Ministry of Transport on a road check carried out in June was given as a footnote to the report on diesel smoke from vehicles from the Society's Technical Committee to the Scarborough Conference. Since that date a further check has been carried out by the Ministry, which has stated that out of 25,600 diesel-engine lorries observed on the roads by Ministry of Transport technical staff in a countrywide check on September 18, 2,470 were emitting too much smoke. The check was made at 80 points.

Of the 2,470 "smokers", 1,600 (or about 6 per cent of the total observed) were prohibited for the carriage of goods. In 55 cases the prohibition took effect immediately; in the other cases a few days' grace was given in which to remedy defects. The remaining 870 vehicles. which were not prohibited because they were not "smoking" so badly, were dealt with by warning letters to the owners and by visits from the department's inspectors.

Comparing these results with those obtained at a similar check in June, some improvement can be seen. The ratio of "smokers" to "non-smokers" fell from one in eight to one in ten: and the proportion of the vehicles observed which were subjected to prohibition notices dropped from seven per cent to six per cent.

Science Library

The Department of Scientific and Industrial Research has prepared a film, and issued an illustrated booklet, describing the National Lending Library for Science and Technology, and its services. The library is at Walton, Boston Spa, Yorkshire, to where it moved from London in 1961. The title of the film stresses the fact that it is primarily a postal lending library, designed and organized to provide a rapid loan service—usually by return of post. The design and arrangement of the stores, the use of chain conveyors, and the high-speed photocopying equipment are among the factors that enable the library staff to deal with the requests for literature that arrive at the rate of about a thousand a day. The library does not lend to individuals but has a list of "approved borrowers" (in which the N.S.C.A. is included.)

The sixth contribution in the series "Compliance with the Clean Air Act" in the Journal of the Institute of Fuel was on "Minimizing the Emission of Dust from Industrial Boiler Plants", by John Sharp, and appears in the November, 1963, issue.

Congratulations to Stoke Newington

On Tuesday, October 1, 1963, the Metropolitan Borough of Stoke Newington completed its smoke control area programme, and thus became the third authority in London, and all Britain, to achieve this distinction. As the others are primarily business communities of the City of London and the M.B. of Holborn, Stoke Newington has gained the added merit of being the first mainly residential authority to become smokeless.

The first Smoke Control Order was made in 1958, and the experience gained with this, and the time involved, led to a scheme for dealing with the whole of the borough in a series of ten areas, timing the work so that at any one time work at different stages would be proceeding on several areas. This was approved and progress with the programme was so steady that it was possible to improve on the target dates, with the result that the full cover of smoke control orders has been completed more than twelve months ahead of schedule.

Because of late applications for grant and the retention of certain payments till two years after the operative date of an Order, there is a considerable time-lag before final figures are available. The estimated expenditure for all ten areas was in the region of £120,000, to be shared as follows: owners or occupiers, £36,000; the Borough Council, £36,000; the Exchequer grant, £48,000. It is said however that it is certain that the final cost will be substantially below this figure.

Adaptation were carried out in approximately 4,500 dwellings, but the final figure will be higher. 20,000 visits were made in connection with survey, queries regarding adaptations and in inspection of work.

In a statement made at a social gathering to celebrate the success of the scheme it was said:

"Public support for the smoke control programme has been very considerable and the steady spread of Smoke Control Orders over the borough has allowed publicity to travel ahead of the actual Order. A marked feature of the work has been the high degree of co-operation from many sources. The Gas and Electricity Boards have handled many adaptations in the borough, and have been ready to co-ordinate their procedure with ours. The National Coal Board has given assistance with technical advice on solid fuel problems in business premises, particularly in finding suitable boiler fuels.

"Officers at the Ministry of Housing and Local Government and the Ministry of Power have at all times been ready to help or to supply information and have frequently expedited consideration of our proposals so that work would not fall behind schedule. Many other people and organizations, not least the local fuel merchants, have contributed to the successful completion of our programme."

World Legislation Survey

Air Pollution: A Survey of Existing Legislation. Offprint from the International Digest of Health Legislation, Geneva, 1963, vol. 14, no. 2; 45 pp. 3s. 6d. or $0.60. Available also in French.

This is a valuable handbook of existing legislation concerning air pollution in a dozen countries, and shows the differences in approach that are being used or attempted. The longest sections are those describing legislation in the U.K. and the U.S.A. It is a most useful book for reference.

LORD HASTINGS AT THE SCARBOROUGH CONFERENCE

The Rt. Hon. Lord Hastings, Joint Parliamentary Secretary, Ministry of Housing and Local Government, opened the Conference, and subsequently the Exhibition, on October 8. After some introductory remarks, including a reference to the publicity the conference had already received on "TW3", Lord Hastings spoke as follows:

THIS is a technical conference of specialists who are dealing with one of the subjects vitally important to every man, woman and especially every child, in Great Britain. Most people here will know that at the end of May, the Minister announced that in conjunction with the Minister of Power he was instituting an immediate review of current arrangements in order to ensure that progress of smoke control was not impeded because of technological changes occurring in the gas industry.

Perhaps, without trespassing too far into the province of the Minister of Power, I ought to say a word or two about these changes, in view of some criticism that has been levelled at us, that is, at the Ministry of Housing.

It has been known for a long time, of course, that the gas industry was arranging to reduce its dependence on coal carbonization. You will no doubt recall the reference to this matter in Appendix XI to the Report of the Committee on Air Pollution, better known as Beaver Report, which reads: "The programme of gas production outlined in the Gas Council publication *Fuel for the Nation* involves a reduction in the expansion of carbonization, and consequently of coke production, to the minimum".

What could not have been foreseen at that time is the pace of the change which is likely to be brought about by the increased use of oil and natural gas and which we are only now beginning to be able to assess with any degree of assurance.

The review which we are carrying out could not in practice have been carried out any earlier and we are getting on with it just as quickly as we can.

Some of you may well ask whether these changes could not be halted or even abandoned if by doing so we would be free to continue with the existing arrangements for smoke control areas.

This is the sort of question which has faced us often enough in the past and inexorably stares us in the face as individuals in all walks of life, and as a nation in so many sectors of our economy.

There can be only one answer if we are to survive, and that is that we must be ready to adapt ourselves to the increasingly rapid pace of technical progress if we are to keep our place in the world.

After all, gas is an excellent smokeless fuel and it is in the interest of clean air as well as of the economy generally that we should produce it as cheaply as possible. Changes in the present arrangements may be unavoidable.

Many of you may have come to listen to me this morning in the hope that I am going to make some statement about the progress of the review, or at least to drop some hint about it, but I am afraid I cannot do that today. The Minister will have something to say himself very soon. I cannot anticipate here what he will say. But I would like to give you all from the Minister two assurances.

First of all, an assurance that the Minister will let local authorities know as fast as he possibly can the conclusions reached as a result of the review. He knows perfectly well that local authorities want to know what changes, if any, may be round the corner.

The second assurance is that the whole purpose of the review is to find the best way of ensuring that in changing circumstances smoke control will still go ahead.

The objective, clean air over our cities, very dear to the Minister's heart long before he became Minister, remains the same. It may be necessary to modify previous methods of achieving these ends.

Today, therefore, Mr. President, I am going to talk not about the Clean Air Act but about the Alkali Act.

The Alkali Act

1963 is a landmark in the history of the world's efforts to conquer air pollution because it marks the centenary of the first Alkali Act of 1863. The ground-work was so well laid then that the Act's lineal descendant, the Alkali Act of 1906, is still with us today, and not only with us but more effective and more comprehensive, I believe, than the legislation of any other country in the world in this sphere. We in this country can and should take legitimate pride in our long history of effective control over industrial emissions.

I therefore feel that at your Conference in this centenary year it would be quite wrong for me not to attempt to give you some conspectus of where the Alkali Act and the Alkali Inspectorate stand today.

The first Alkali Act was passed just a hundred years ago—July 28, 1863—and came into force on January 1, 1864. It dealt only with Alkali works, defined as "works for the manufacture of alkali, sulphate of soda or sulphate of potash in which muriatic acid gas is evolved". It required that 95 per cent of this gas should be condensed, a Committee of the House of Lords having satisfied itself from a study of the evidence that this was a practicable possibility. It also required alkali works to be registered and an inspector and sub-inspectors to be appointed. With characteristic caution, the Victorian legislators made the Act serve an apprenticeship of five years, but it survived the test and in 1868 this limitation was removed.

The first Alkali Act is of interest not only as the forerunner of the present legislation but also because it established a principle of "prudent tolerance"—to use a happy phrase of Dr. Carter's, the present Chief Alkali Inspector—which secured the protection of the public without however, stifling enterprise and initiative and so allowed the chemical industry freedom to develop.

If this principle was thought to be justified in the heyday of Victorian prosperity, how much more justified must it be today, when our share of world trade is so much less and our industries face ever-mounting competition from overseas?

Now the Inspectorate's approach is and has always been at once vigilant and constructive, and it has met with the ready response of industry, as the scope of their jurisdiction has widened over the years until it embraces the present wide range of processes (58 in all) I am told, in the chemical, metal, manufacturing, ceramic and allied industries.

Revolutionary developments in the chemical and other industries since the war have transformed what used not so long ago to be laboratory techniques into large-scale commercial operations.

Some idea of the enormous expansion which has taken place in these industries in England and Wales may be gleaned from the following figures taken from the Chief Alkali Inspector's report of 1962:

1. The manufacture of sulphuric acid (calculated as monohydrate) was over 2½ million tons in 1962 compared with the mere 820,000 tons in 1938;
2. Production of nitric acid is increasing steadily and is already between 6 and 7 times the pre-war amount;
3. The throughput of crude and process oils in England and Wales in 1962 was 48 million tons compared with just 2.5 million tons in 1938.

These are enormous quantities, calling for continuous meticulous attention to supervision and maintenance.

The Keynote—Co-operation

The keynote sounded again and again in the Chief Inspectorate's report is co-operation—co-operation with other Government Departments such as the Department of Scientific and Industrial Research, the Ministry of Agriculture, Fisheries and Food and the Ministry of Health; co-operation with local authorities and their officers who are working in a similar field, co-operation with industry and, last but not least, co-operation with the general public for whose protection and convenience the Inspectorate was first appointed.

Let me deal with each of these in turn.

Co-operation with other Government Departments is no doubt something which we ought to be able to take for granted, though examples to the contrary are not unknown. Suffice it to say here that there is the closest working liaison between the Chief Inspector and his professional colleagues in other Departments.

I do not need to tell this audience that close and cordial co-operation with the local authorities and their officers is a paramount necessity. You know it and we know it, and I am sure that there is the greatest goodwill on both sides.

During the past year Alkali Inspectors for instance made 278 visits to works outside the scope of the Act. These were for the most part carried out in collaboration with officers of the local authority concerned, the Inspector's function being merely advisory, the local authority being responsible for any further action arising out of the visit.

District Inspectors have also given talks to local authorities and industrial groups on problems of industrial emissions, and also attended meetings of local joint committees dealing with clean air problems. We are in this business together and the successful administration of clean air legislation demands that there should be mutual confidence and esteem. The tradition of co-operation with industry, as I have said, is as old as the Inspectorate, and as vigorous today as ever it was.

Let me quote you a few examples.

Smelting works, although they are required to register, remain unscheduled, that is to say are not required by the statute, or by any order made subsequently, to adopt the best practicable means for preventing the escape of noxious or offensive gases.

Nevertheless, the industry has adopted on a voluntary and co-operative basis a "best practicable means" for arresting fume and dust, and has installed high chimneys to secure adequate dispersal of sulphur dioxide. Massive pollution of the air by smelting works has ceased, without recourse to further legislation.

In the case of new plant for producing yearly some 80,000 tons of carbon bisulphide, the Inspectorate has been in touch with the company concerned from the pre-design stage.

All matters concerning the treatment of emissions and chimney heights at the Spencer Works of Richard Thomas and Baldwins were discussed and agreed at the design stage and all requirements were met.

There has been close association with the Joint Iron Council in dealing with the difficult problem of emissions from hot blast cupolas. A working party of the industry and the Inspectorate has made an exhaustive investigation of the problems, visiting works where all types of arrestment plant are installed.

There have been discussions with the Central Electricity Generating Board on big power stations to be commissioned in future years. All will be provided with chimneys ranging up to 650 ft. in height, and coal-fired stations will have extremely efficient arrestment plant.

I could go on multiplying examples and showing what they cost, in the case of C.E.G.B. particularly.

These negotiations are inevitably laborious and protracted, making heavy demands on scientific and technical knowledge, and upon the imagination. All must submit in the end to the practical test—will it work? It all takes time and it all takes money—money very well spent indeed, but which still has to be found.

For example, when we think of the electricity supply industry we tend to think of the vast new power stations in comparison with which many of the older stations are mere dwarfs.

Many of these stations have been in service for 30 years or more and all of them date from a time when the standards required for grit arrestment and for chimney heights were much lower than those now set. These stations must still be kept in service in order to deal with peak loads.

The Central Electricity Generating Board has decided to modify or renew grit arresting equipment or to convert to oil-firing at these stations, so as to bring them more into line with modern practice until it becomes possible to dispense with them. The cost of the approved work at these old stations alone will be about £11 million.

Let no one suppose, however, that the Inspectorate is complacent.

Continuous Reappraisal

In the scheduled industries there is a continuous reappraisal of the standard of emission tolerated hitherto—for example, the standard of tolerance for acid emissions for phosphoric acid plants is being reconsidered; the tolerance for small lead works has been reduced and the traditional figure of the Electricity Commission from a residual escape of grit and dust to air of 0·4 grain per cu. ft. has been revised to 0·2 grain for small to medium power stations and a very much lower, but as yet not precisely defined, figure for the super power stations.

I come last to co-operation with the public.

The Chief Alkali Inspector personally addressed your Annual Conference last year, and I am sure we are all sorry that he is not able to be here today.

He addresses us all of course every year in an annual report with which I am sure most of you are familiar, but in any case, let me commend it to you. In the best sense of the words it is a blue book, but it distinguishes itself from other blue books not only by its red cover, but by its style, which, as a famous Frenchman once observed, is the man.

It is a painstaking review, industry by industry, of the year's achievement with a wealth of technical detail made intelligible to the layman in plain, pungent prose. It contains fascinating accounts of the historical development of great industries, written in a disarmingly conversational style which should not blind us to the great erudition and experience on which they draw.

The whole of the report is shot through with a candour which, as a politician, I can only envy, and with a humour which I cannot emulate. It is clearly a labour of love.

I commend it to you, with all my heart. This is not a panegyric; it is no more than a well-deserved tribute to a great public servant.

The National Society for Clean Air has doubled its members since the introduction of the Clean Air Act, and far from coming to the end of its task is really only just beginning. It is going ahead and particularly in the field of public relations, and with public relations with the people—and as the Mayor said, with the housewife in particular—you have an enormous and most important task to fulfil. Therefore I wish this Conference every good luck in its deliberations and I can assure it that we at the Ministry are very aware of its vital importance, as I said, to every man, woman and child in his country. I am sure your labours in the last few years have had very noticeable effects and in the years ahead I hope that we shall really succeed in getting clean air over much the larger part of Great Britain especially of course in the areas named as "black areas".

The Scarborough Conference

THE conference had shadows of uncertainty hanging over it—uncertainty about the extent to which the solid smokeless fuel situation was going to affect progress, and uncertainty about what steps the Government was going to take. Lord Hastings, whose address in opening the conference is printed on other pages, was of course unable to anticipate what might happen, and for conference itself to try to discuss the future of the smoke control area would have been unrealistic. This was generally recognized, and only a few delegates, perhaps not being very clear about things, seem, as alleged (presumably by one of them) in *Municipal Engineering* to have thought the conference lacked fire and enthusiasm. On the other hand, an experienced delegate, after an absence of some years, found that the conference was a much more responsible and mature body than it used to be. Fireworks are enjoyable and create a brief excitement—but they are soon over, having accomplished nothing. "Better than ever!" was the verdict of another delegate as the last session drew to a close.

At the opening session there was not only Lord Hastings's address, and Dr. Parker's first Presidential Address

At the opening of the Exhibition. Left to right: Dr. J. L. Burn (Chairman), the Mayor and Mayoress of Scarborough (Alderman and Mrs. W. H. Smith), Dr. A. Parker (President), Lord Hastings, and Mr. Stanley E. Cohen (Hon. Treasurer) (which was preprinted and will also be in the *Conference Proceedings*), but also a most knowledgeable and thoughtful welcome by the Mayor of Scarborough, Alderman W. H. Smith —knowledgeable, that is, about the subject and purpose of the conference and not just about the town. It was greatly appreciated by the delegates and will also be recorded in the *Proceedings*.

The other sessions all went off well, the authors presenting their papers with skill and authority, often with humour, and, in the case of the women speakers, with charm. Delegates found that Dr. Mary Catterall was reading a paper quite different, though on the same theme of the human problem of air pollution, from the one she had written. Because of the interest it aroused the spoken address is being printed in this journal, while the original will be in the *Proceedings*. All most irregular, and therefore to be applauded.

The *Municipal Engineering* correspondent already mentioned complained that there had been five technical papers at one session. In terms of immediate digestibility by delegates at the meeting (especially if they had not read the papers beforehand) there may be something in this view, but it must be remembered that one of the functions of the conference is to provide a platform for enabling new information to be published and disseminated far afield. Press cuttings are still coming in, and abstracts will travel round the world—the papers presented at Scarborough are still aiding the clean air movement and some will continue to do so for months. (Compared with the 106 papers to the last U.S. conference our programme looks positively meagre!)

The works visits, although they could be attended by only a small proportion of delegates, were reported to be instructive and enjoyable. The Conference Committee hopes to arrange more for Harrogate in 1964. The programme of clean air films (as well as the evening show of general interest films) was also appreciated by those not taking part in the visits.

We do not think any delegate failed to enjoy to the full the hospitality provided by the Mayor and Mayoress on the Wednesday evening, whether it was the first-class variety show at the Spa Theatre, or the reception with cabaret at Olympia.

The Exhibition

The Society's Clean Air Exhibition, taking up rooms on two floors, as well as a frame tent, at the Spa, was agreed by all to be the best yet. It was certainly larger, more comprehensive, and again had that quality that our exhibitors seem to bring to the event—it is difficult to describe, but gives to the exhibition as a whole an atmosphere that is satisfying and elegant in appearance, and an air of orderliness, harmony and confidence. It was well attended, both by delegates and by visitors from the town and from far afield. The anxious question of whether the exhibitors were satisfied and would come again seems to have been answered by the fact that the 1964 exhibition is already almost fully booked up!

The dates for 1964, by the way, are October 20 to 23, and as mentioned above the place is Harrogate.

What are we responsible for?

". . . The Whisky à Gogo is one of the more respectable of 730 clubs where Mancunians can eat, drink, dance, watch cabaret and gamble till dawn. This explosion of night life is one aspect of Manchester's upsurge of vitality in the last decade. This renaissance can probably be attributed to two main causes. The decision in 1952 to abolish smoke with the revolutionary 'smokeless zone', since widely copied elsewhere. Secondly, Manchester's final release from its hereditary bondage to cotton. . . ."—*Fred Majdalany, in the London Evening Standard, on "How the Other Half Lives"*

INTERNATIONAL SECTION

Canada

URBAN VENTILATION IN MONTREAL*

From P. W. Summers

IT seems rather ironical that Canada, with a population density of only 4·8 per square mile and a vast supply of clean, uncontaminated arctic air, should be plagued with air pollution problems. But Canada’s 19 million population is nearly all concentrated in a narrow strip across the southern part of the country within a few hundred miles of the border with the U.S.A. Before World War II Canada led an essentially rural life with farming and forestry the mainstay of the economy. Since the war there has been a rapid industrialization of the country due to the tremendous growth of oil, mining and manufacturing industries to the point where Canada now ranks sixth in manufacturing output for the nations of the world although only 27th on total population. This in turn has produced a remarkable growth in urban populations, with some of the medium-sized cities doubling their population during the last decade. Large concentrations of industry have built up in and around the two largest metropolitan areas of Montreal and Toronto with respective populations of just over and just under two million.

Residents of Montreal have long been aware that they live in a smoky and sometimes smelly city. This fact is brought home very forcibly on returning from the Laurentian Mountains just to the north. As one leaves the crystal clear mountain air and returns to the St. Lawrence Valley a thick pall of yellow-brown haze can usually be seen hanging over the city. Even more striking evidence is seen in the winter months as the pure white snow lying on the ground in the open countryside gradually takes on an off-white appearance and then finally becomes a dirty grey colour in the city itself.

It is only in the last few years that any serious attempts have been made to study the pollution problem in Montreal. One of these is a meteorological study commenced early in 1960 by Weather Engineering Corporation of Canada Ltd. (WEC), a firm of consulting meteorologists. An A.I.S.I. Automatic Air Sampler of the type in general use through North America was installed in their offices in a business-residential area near the centre of Montreal. These samplers draw in outside air through a strip of filter paper at a known rate and the stain caused by the collection of soot, dust, etc., is measured photo-electrically to obtain an optical density. This measurement is then corrected for air flow rate, area of spot and sampling time to arrive at a soiling index. During the winter months readings are taken at every hour in order that detailed correlations can be made with the short period changes in the meteorological variables. Within a few weeks two interesting facts came to light. Firstly, that central Montreal is

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* This report is based on a paper presented to the National Congress of the Canadian Branch of the Royal Meteorological Society held in Quebec City on June 5-6, 1963, amended for this journal by the author.

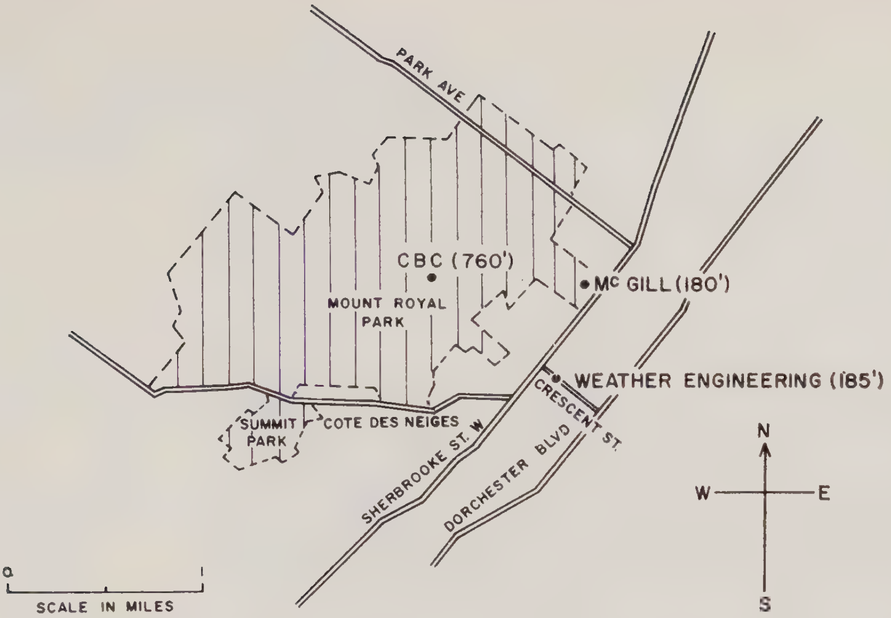


Fig. I. Map showing the location of three smoke samplers in central Montreal. Height of air intake above M.S.L. shown in parentheses

very smoky and on a par with some of the worst areas in the U.S.A. for which comparable data are available. Secondly and perhaps more important, the meteorological conditions responsible for the highest readings were often quite different from the "classical" anticyclonic weather which has received so much attention in the past.

In order to confirm those high readings and to provide more data for a study of the interesting meteorological aspects, the Department of Meteorology at McGill University set up two more smoke samplers early in 1961. One was installed in the Canadian Broadcasting Commission's (CBC) transmitter building situated at a height of 600 feet above the city on top of Mount Royal, which is close to the geographical centre of Montreal. The other was located on the University Campus at the foot of Mount Royal and about a half-mile NNE of the Weather Engineering site.

To date well over 50,000 soiling index measurements have been obtained from these three samplers. In order to handle this large amount of data punched cards have been prepared—one for each hour—containing the three smoke measurements together with the corresponding meteorological data from the Montreal Airport. The analysis and tabulation is performed on the IBM 1410 computer at the McGill University Computing Centre. Some of the more interesting and important results will now be presented.

Seasonal Variation

The seasonal variation in smoke

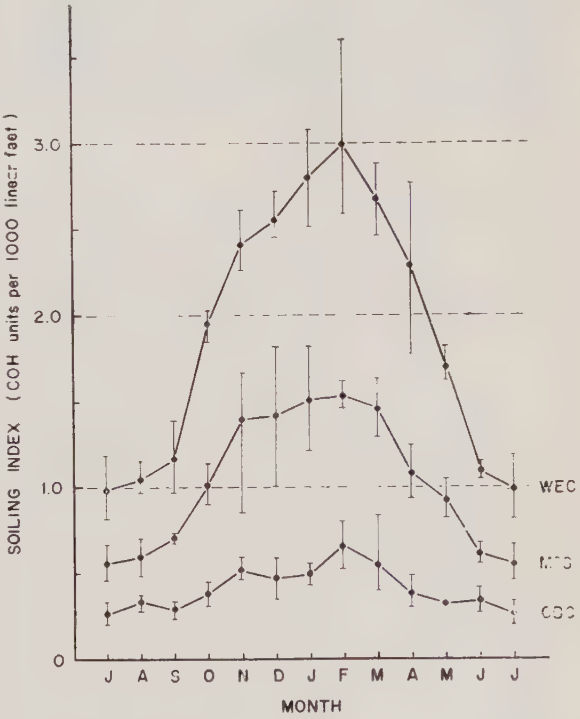
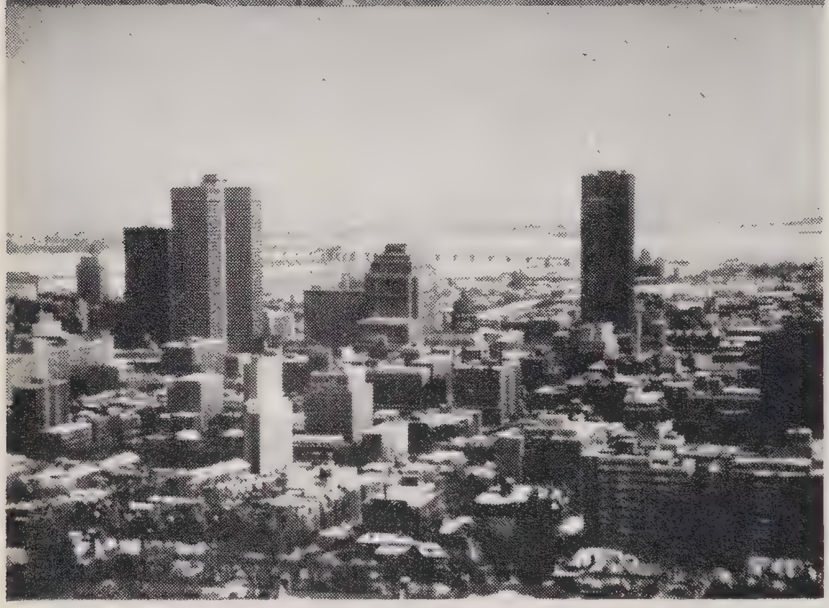


Fig. II. Seasonal variation of Soiling Index at the three locations in central Montreal. Vertical lines indicate range of mean monthly values

Taken from lookout on Mount Royal overlooking central Montreal showing the newly built skyscrapers towering to a height of 600 *ft. above the city*

No. 1. *Extremely poor ventilation:* 0935*EST Nov.* 29, 1962, *during prolonged spell of anticyclonic weather. Temperature* 33°*F. Wind speed only* 2 *m.p.h. Mixing depth* 350-400 *ft. Soiling Index* 10·7 *coh units*



No. 2. *Excellent ventilation:* 1400*EST March* 9, 1963, *several hours after passage of cold front bringing in fresh supply of clean arctic air. Temperature* 17°*F. Wind speed* 15 *m.p.h. Estimated mixing depth* 3,500 *ft. Soiling Index* 0·8 *coh units*

content of Montreal's air conforms with that found in many other cities, namely a maximum in the winter months and a minimum in the summer months. Most of the difference between the readings at WEC and McGill can be explained by the location of the sites with respect to the Mount Royal Park. The prevailing wind direction is from the W and SW and so for about 45 per cent of the time the air arriving at the McGill sampler has spent the last two miles of its trajectory skirting around or passing over a "smokeless zone". Correlations of soiling index with wind direction during the midwinter months show very clearly that, with a SW or W wind the amount of smoke in the air arriving at McGill is reduced by 60-70 per cent, whereas with other wind directions the reduction is only 5-15 per cent attributable to the immediate surroundings of the campus itself.

The smoke concentrations recorded atop Mount Royal show only a slight seasonal change and are always much less than in the city 600 ft. below. A similar sharp fall-off with increased elevation has been found in Sheffield, England, amongst other places.

On a typical settled anticyclonic morning the air at 600 ft. is usually completely free of any trace of smoke but a thick layer of smoke can be seen extending up to a height of 500 ft. above the city as shown in the accompanying photograph. This, incidentally was taken during an extended period of anticyclonic weather which persisted

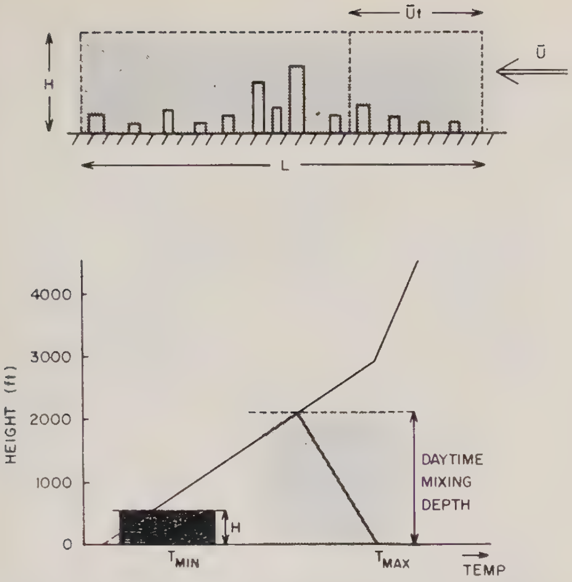


Fig. III. Diagram illustrating ventilation by horizontal wind $\overline{U}$, and a typical daily variation of mixing depth over the city in mid-winter. If P is the rate of production of smoke per unit area and X is the concentration of smoke in the city's atmosphere then:

$$\frac{dX}{dt} = \frac{P}{H} - X\left(\frac{\overline{U}}{L} + \frac{1}{H}\frac{dH}{dt}\right)$$

over south-eastern Ontario and south-western Quebec from November 25 to December 5, 1962, and gave some of the highest soiling index readings recorded during this study. It is interesting to note that the hemispherical weather pattern at this time was such that the next area of anti-cyclonic weather, one wave-length downstream, developed over the British Isles also producing a severe smog episode during the period December 3-7, 1962.

There are many ways in which the soiling index data can be analysed but the most promising is a study of the diurnal or hour by hour changes, and how these vary from season to season. In many months of the year the average hourly values immediately suggest that, during several separate periods of the day, the soiling index is either increasing or decreasing exponentially with time. That is to say the rate of change of smoke concentration at any given time is only dependent on its value at that time and also that after an elapsed time of several hours the concentration approaches some equilibrium value. This equilibrium value as one would expect depends on (1) the rate at which smoke is being produced (2) the rate at which it is being removed by the natural ventilating processes of the atmosphere and (3) the volume of air through which the smoke is mixed. This in turn suggests a simple mathematical model of the ventilation process at work in the city's atmosphere based solely on the horizontal wind flow and the vertical depth through which the smoke is mixed.

The idea of a mixing depth has been applied successfully in the Los Angeles area in considering the surface layer of air up to the base of the semi-permanent inversion aloft. This mixing depth can be readily obtained from the upper air temperature sounding. Its use has been extended in recent years to climatological studies in order to compare the atmosphere's ability for vertical mixing from place to place and season to season.

On most nights the ground cools due to a net loss of long-wave radiation and as a result the lowest layers of the atmosphere become stably stratified which inhibits vertical motions. However over large urban areas the so-called "heat island effect" provides heat to the air in contact with the streets and buildings. This tends to prevent the formation of the stable layer and vertical mixing occurs up to a height of several hundred feet. This night-time mixing depth does not vary much from month to month, and in Montreal is usually around 4-500 ft. On the other hand the maximum daytime mixing depth shows a marked and very important seasonal change. In the summer months it averages over 5,000 feet, but in the months November through March when the ground is snow-covered daytime vertical mixing is usually confined to a depth of only 2,000 feet. This of course is reflected in the much greater diurnal variation of smoke in the summer months compared to the winter.

Ventilation by the wind is considered as the influx of clean air at the upwind end of the city at a rate proportional

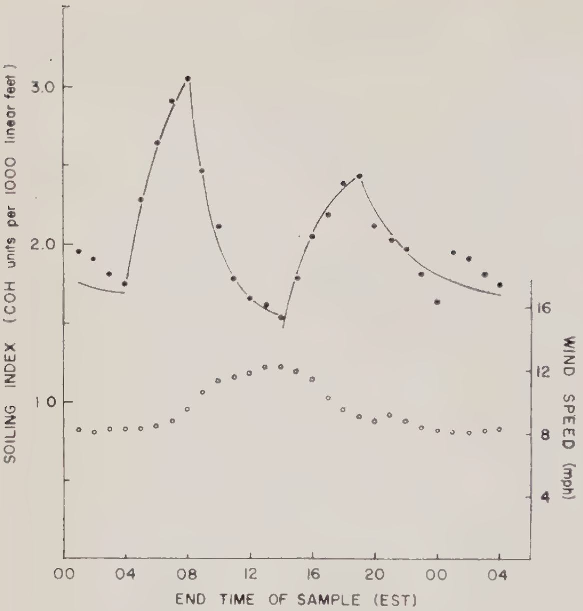


Fig. IV. Diurnal variation of Soiling Index at WEC location for October, a month with a high frequency of anticyclonic weather. Dots are observed values. Smooth lines are the best fit solutions of the equation for increase and decrease of smoke concentration with time

to the wind speed, and the removal of a corresponding volume of dirty air at the downwind end. During this time smoke is continually being poured into the atmosphere by thousands of chimneys assumed to be evenly distributed over the city. All of these ideas can be put in the form of a simple mathematical equation which gives us the rate of change of smoke with time. The solution to this equation is then fitted to the observed data as shown in Fig. IV. Since the changes in the meteorological variables such as wind speed and mixing depth are known it is thus possible to learn something about the way in which the production of smoke varies through the day.

The major sources of smoke can be classified according to the time of day, the days of the week or the months of the year in which they are operating. Application of the ventilation model to the morning peak in Soiling Index on Saturdays and Sundays compared to week days both in summer and mid-winter gives an estimate of the percentage contribution of the various types of source.

The contributions will vary somewhat during the day due to some industries shutting down for the night and also the changes in traffic flow. It is interesting to compare the results for central Montreal with those obtained several years ago in Paris. The Paris figures refer to the day as a whole and not just to the morning peak. This may account for the large difference in the effects of traffic, rather than a difference in driving habits between Frenchmen and Canadians! However in both cities the outstanding contribution to the smokiness of the atmosphere in winter is the consumption of fuel for heating purposes.

In Montreal cleaner burning natural gas is becoming more popular but the use of oil for heating still predominates. Fortunately very little coal is used. Even so the task of providing enough heat to keep two million people warm

Smoke Source	Mid-Winter		Summer	
	Montreal %	Paris %	Montreal %	Paris %
Winter heating of buildings . .	55–65	60–65	—	—
Continuous industry, incinerators, etc.	15–25	10–15	45–55	20–40
Week-day industry	10–20		30–40	
Traffic	5–10	25–30	15–20	60–80

Table showing the estimated percentage contributions of smoke from the various types of source to the morning peak of Soiling Index in central Montreal compared to the results obtained by a study in Paris (La Météorologie 1957 p.417).

in January and February when the outside air temperature only averages 14°F. (−10°C.) necessitates the use of enough oil to cause almost three times as much smoke in the atmosphere in mid-winter as in summer.

In summary; analysis of smoke data in central Montreal suggests a simple model of urban ventilation. This model can be utilized to obtain very useful estimates of the contribution to the smokiness of the city's atmosphere from various sources. A study of meteorological conditions in south-western Quebec indicates that the daytime vertical mixing of the atmosphere is severely restricted during the winter months when the ground is frozen and snow-covered. Fortunately the winds are stronger at this time of the year, enhancing horizontal ventilation and off-setting somewhat the effects of snow cover. During March and early April the first warm air masses begin moving up from the south, but as long as the ground is still frozen the air in contact with the ground is continually chilled and strong inversions are able to persist throughout the day even with winds up to 10 or 15 m.p.h. It was under these sort of conditions that the highest recorded Soiling Index (15·4 COH units/1,000 ft.) occurred during the evening of April 14, 1960.

This snow effect is even more important in the Canadian Arctic where it lasts most of the year and almost continuous stability exists in the lowest layers of the atmosphere. Obviously any future developments of industry and town sites in the "North" should take into account, not only ventilation by wind, but the vertical mixing depth characteristics of the area.

U.S.S.R.

REPORT FROM MOSCOW

From Konstantin Glovatsky

Chief Engineer, Moscow House Designing (Moszhilproyekt) Institute

The problem of air pollution control in Soviet cities was tackled in the early 'thirties. Special faculties were set up at medical schools for training sanitation experts. At that time a general plan for the reconstruction of Moscow was also drawn up envisaging the division of the city into industrial and residential zones, the construction of wide, well-ventilated streets and the creation of green belts between the zones.

In 1949 a law was adopted on measures for combating air pollution and improving the hygienic living conditions of the population. This law prohibits the commissioning of any factory lacking chimney emission cleaning devices.

Only 10 to 15 years ago the hundreds of steam engines bringing trains into Moscow's nine railway terminals polluted the city's air. Five years ago this problem was solved by the introduction of electric traction, and this applies not only to Moscow but to many other big cities in the U.S.S.R.

But there still remains motor traffic to poison the air. What is being done to prevent cars from polluting the air with exhaust gases?

First of all, the use of ethylated petrol was rejected. Cars using diesel motors were barred from big cities (Moscow, Leningrad, Kiev, and so on) and also from health resorts. The introduction of gas fuel (a propane-butane mixture) for goods vehicles proved to be a good measure. At the same time purifying devices for cars are now being developed.

Another enemy of pure air in the cities are the chimneys of factories and district heating systems. One way to combat it is by the removal of factories beyond the city limits, a measure that has been applied since the early 'thirties. This process is being carried out regularly, simultaneously with the reconstruction of cities. The factories remaining within the city limits were separated by green belts from 15 to 500 metres wide.

However, the factory chimneys continued to smoke. It was necessary to render the emissions harmless. That was tackled by a special organization called Gazo'ochistka, which means Gas Purification. Its staff developed methods for the mechanical and chemical purification of chimney gases from ash, grit and sulphur oxides. Simultaneously, wherever possible the factories went over to electric power and heating, or gas. There was a whole series of ordinary dust extractors, ranging from TsN-11 to TsN-24, used as dust and grit collectors in factories. But though simple in design and maintenance, they have a comparatively low grit and dust extraction efficiency (up to 77 per cent) and are of large dimensions.

If the factory lacks space for such bulky collectors, smaller ones are erected—the so-called louvred inertial type collectors built by the U.S.S.R. Heat Engineering Institute. This apparatus is a combination of a separating device plus a small collecting hopper.

The louvred dust collector can fit in the flue of any appliance causing air pollution, from a kitchen hearth to a powerful boiler unit of a heat and power plant. It can be mounted either horizontally or vertically, and is used not only for combustion appliances but also for dust-producing processes. It is true, however, that its collecting efficiency is also not very great.

Gazo'ochistka suggested also a wet method of settling dust with an efficiency of 90–95 per cent. This method involves the use of scrubbers with Raschig rings, VTI wet scrubbers and pellicular arrestors. In all these systems the smoke is washed with water, by which high collection efficiency is attained.

Battery multi-unit cyclone collectors are proposed by the Gas Purification organization and the Central Boiler and Turbine Institute. These collectors do not require any water expenditure as the scrubber installations do. Nor do they need electricity, as electric filters. The designers decided to separate the flue gases into a large number of streams and to direct each one into a small cyclone. The efficiency attained in such simple devices reaches 85 per cent.

There used to be fireplaces and ovens in many of Moscow's old houses. Although the fireplaces made the home cosy, they had to be given up and replaced by central heating.

The general trend in heat supply for the home is power heating of cities. In Moscow this process will be completed in the next two or three years. Power heating there has reduced the number of "smoke-producing" installations to approximately one-third.

Heat-and-power plants and large district boiler units with an established heat capacity of 100–300 megacalories per hour will become the only heat supply sources. The small heating boilers in blocks of flats will be joined to large units where good coal will be used instead of lignite.

The elimination of small boiler houses had reduced the number of chimneys. And those that have remained are equipped with highly-efficient dust-removing installations. The standard height of chimneys has been set in accordance with the daily consumption of solid fuel. For instance, with a consumption of 5 tons of coal a day, the chimney of the boiler must be at least 30 metres high. If the factory consumes 100 tons of fuel a day, the chimney must be no less than 80 metres high.

At the same time industrial concerns were "heat taxed": they were instructed to provide steam and hot water from their well-appointed boiler rooms for the needs of the population.

The shifting of all communal boiler rooms serving flats and communal enterprises to operation on the ideal fuel—gas—played a decisive role in cleaning the air. Gas is ideal not only because it burns without emitting smoke but also because in this case

Gas Cleaning Methods (Dust Removal)	Expenditure of Electricity in kwh. per 1,000 cu.m. of Operating Gas	Expenditure of Metal in tons per 1,000 cu.m. of Operating Gas	Cost of Dust Removal per 1,000 cu.m. of Operating Gas	Expenditure of Water per 1,000 cu.m. of Operating Gas
Battery Dust Collectors . .	0·55–0·85	0·17–0·20	80–100	0·08
Louvred Collectors . .	0·40–0·70	0·045–0·056	30–40	0·08
Centrifugal Scrubber Plants . .	0·40–0·65	0·07–0·01	60–80	0·12–0·15
Electric Filters . .	0·30–0·50	0·60–0·80	330–450	0·10
Average-Weighted Data	0·52	0·61	91·0	0·09

the boiler rooms can be equipped with automatic devices which control both combustion and ensure safety.

Important measures have been adopted also for removing harmful mixtures, such as sulphur compounds, from the flue gases.

The accompanying table gives some technical and economic indices.

The water consumption shown here includes also the hydraulic removal and dumping of the dust. When using hard coal as a fuel, it is necessary to spend per ton burned: electricity—no less than 10 kw.; metal—12 tons; capital expenditure—1,800 roubles; water—no less than 1·80 cu.m.

Of course, all this is very approximate. It all depends on the specific conditions, the dust collecting system chosen, the kind and grade of fuel, its chemical composition, on one's preferences, and on the regulations that are in force.

U.S.A.

NEW FEDERAL AIR POLLUTION LEGISLATION

From Arthur C. Stern

U.S. Public Health Service

The U.S. House of Representatives has passed and sent to the U.S. Senate a Bill which would replace existing Federal Air Pollution legislation. The Bill, designed to augment the Federal air pollution programme, reaffirms that the primary responsibility for abatement and prevention of contaminated air rests with the States and local communities, but provides for increased Federal technical and financial assistance.

For the first time, the Federal Government would be authorized to award grants for the partial support of abatement programmes by State and local air pollution control agencies. A total of $25 million would be allocated for this purpose over a 5-year period.

The Bill further authorizes the Secretary of the U.S. Department of Health, Education, and Welfare, in cases of inter-state air pollution, to call a conference of the affected and concerned parties to study the problem and make recommendations for its abatement. This could be done either upon his own initiative or upon request. If after six months remedial action is not taken, the Secretary may call a public hearing to secure abatement action. As a final step, the Secretary may request the Attorney General of the United States to bring suit to secure abatement. Before this last step is taken, however, the Secretary must obtain from the complaining State notice that an effort to enter into a compact with the offending State has been made but that the effort has failed.

The same procedure is generally followed in cases of intrastate pollution problems except that the Secretary may only call a conference upon request by a State governor or official of the local community. Also, enforcement measures are reserved to the States.

The Bill further authorizes the establishment of a national research and development programme and specifically calls for studies on the effects on human health of motor vehicle exhaust emissions.

The U.S. Senate committee having appropriate jurisdiction has reported out a Bill which varies in some respects from the above House Bill, principally in its provision calling for substantially larger amounts of money ($182 million over a 5-year period) for an expanded research programme and the granting of financial aid to air pollution control agencies.

The Senate Bill also authorizes the Federal Government to: initiate a research programme to develop improved, low-cost techniques for extracting sulphur from fuels; establish air quality criteria to assist air pollution control agencies in their abatement programmes; and, appoint a technical committee of both Federal and industrial representatives to recommend research programmes to develop devices and fuels to abate automotive vehicle and fuel pollution.

If the full membership of the Senate votes favourably on the committee-approved Bill, conferees from both the House and Senate must then meet to iron out differences between the two pieces of legislation. The compromise Bill will then be submitted to both Houses for a final vote.

A SENATORIAL INQUIRY

From the U.S. Government comes a 502 page report on air pollution control, the full title of which is "Hearings before a Special Sub-Committee on Air and Water Pollution of the Committee on Public Works, United States Senate, 88th Congress" on "Bills Pertaining to the Prevention and Abatement of Air Pollution". The Bills themselves are described in the note above from Arthur C. Stern.

The hearings took three days, September 9 to 11, 1963, and the report is a verbatim account, plus statements made by witnesses, written statements from organizations, and a number of additional printed exhibits and information. It is a truly exhaustive and formidable document, which defies summary, and in which some political overtones can be detected. Behind the inquiry and the proposed Bills is the apparently very controversial question of whether, and to what extent, air pollution should be controlled by Federal legislation.

From the outside point of view at least, the most interesting part of the volume is Appendix I, which is a 62-page report on air pollution prepared by the staff of the committee, with the assistance of the U.S. Public Health Service. This is a first-class survey, almost a text-book, of the air pollution problem in the States, and it has been published also as a separate booklet. There are seven chapters: the Problem, the Effects of Pollution, the History of Federal Programme, State, Local and Non-governmental Programmes, Status of Present Technology, Standards for Air Pollution Control, and A Look into the Future. There are also two appendices—a summary of State responses to a questionnaire, and brief digests of State air pollution laws.

The summary with which the report is prefaced is a statement which both for interest and the record, we reproduce in full, as follows:

This report demonstrates that across the Nation, the problem of air pollution grows ever more serious. Current efforts by industry and Government to lift the curtains of smog which more and more frequently veil our cities, from coast to coast and border to border, are meeting with only limited success. The rapid deterioration of the quality of our air has reached the point at which more effective control measures can no longer be postponed. To underline this point, research continues to provide new evidence that air pollution is objectionable, not only for its aesthetic and nuisance efforts, which we can see and smell, and its economic damages, which are more varied and costly than we had supposed, but also because of its hazards to health and safety.

Pollution is increasing faster than our population increases, because our rising standard of living results in greater consumption of energy and goods per person, and our production and transportation activities increase on both accounts.

Technical procedures are available which can prevent the discharge of most contaminants to the air. The application of some of these procedures involves considerable cost. However, failure to use them is now costing the public far more in economic damages, even aside from the nuisances and hazards to health associated with air pollution.

Despite the lack of satisfactory answers to certain specific problems, such as motor vehicle pollution and sulphur oxides from fossil fuels, a significant reduction of pollution from most of our problem sources is now possible through more widespread application of proven control principles.

In this country, we have only begun to attack air pollution realistically. The Federal programme of research and technical assistance has defined important facets of the problem and provided guidance to States and communities in assessing the nature of their local problem and demonstrating remedial measures.

One-third of the States have established programmes to deal with air pollution, but most of these are, so far, quite limited in scope. Local government programmes, where they exist, are generally understaffed and without sufficient financial and trained manpower resources to meet their needs properly. Only 34 local programmes have annual budgets exceeding $25,000 and seven of these are in California. Of the other 51 local air pollution control agencies, 21 try to function on less than $10,000 per year. In the past decade, despite a 30 per cent increase in urban population, there has been outside of California, no overall increase in manpower to combat air pollution at the local level.

It has been estimated that in 1961 major air pollution problems existed in 308 urban places. This represents an increase of 84 in a decade. About 7,300 places, housing 60 per cent of the population, are confronted with air pollution problems of one kind or another.

The American public looks forward to a growing population, an expanding economy, and an improving state of well-being. Essential to this is clean air. To compensate for past neglect of air quality conservation, a greater effort is required now, by the public, by industry, and by governmental agencies at all levels. The nationwide character of the air pollution problem requires an adequate Federal programme to lend assistance, support, and stimulus to State and community programmes.

There is need for the establishment of air quality standards in terms of known and suspected effects on what is necessary for the protection of human health and welfare, agriculture, and property.

A number of States do not have air pollution control laws; others have laws which have control authority only, or no control authority, but local option legislation and research and technical assistance authority.

It is quite evident that an aggressive programme of research needs to be directed towards providing assistance in developing appropriate State and local air pollution control laws and standards. There is also a need for nationwide enforcement and standards and in addition consideration needs to be given to the international aspect of air pollution.

AIR STAGNATION ALERT SYSTEM

Since October 1, 1963, an Air Stagnation Alert System has been in operation in the United States, excepting Alaska and Hawaii. Prior to that date, the air pollution warning system had been in effect for three years in the eastern two-thirds of the country. Bulletins are issued when any region of the country can be expected to undergo 36 hours or more of air stagnation.

The warning system is a joint venture of the U.S. Weather Bureau and the U.S. Public Health Service. The alert bulletins are issued from a central headquarters at the U.S. Public Health Service's Robert A. Taft Sanitary Engineering Centre in Cincinnati, Ohio, where information is received daily from weather bureau stations throughout the country.

During the three years the system was in effect in the eastern two-thirds of the nation, some 36 periods of air stagnation occurred, 29 of which were accurately forecast. Known episodes that were not predicted were generally of short duration. The meteorologists at the Taft Centre consider this a high percentage of accurate predictions and believe that more experience and further refinement of techniques will enable them to do better.

When an area is notified of an "alert", the States and communities involved may take appropriate measures to reduce air pollution by banning open burning, converting to "smokeless" fuels, curbing or halting certain industrial operations, or restricting the use of motor vehicles.

Weather Bureau stations throughout the country are kept advised of the progress of each alert, of any change in the area affected, and the expected time the alert will terminate.

The U.S. Public Health Service and the U.S. Weather Bureau have called on local health and air pollution control agencies throughout the nation to co-operate, in their own interest, by reducing air polluting activities during alerts.

U.S.A.

A.P.C.A. CONFERENCE AT PITTSBURGH

The 56th annual meeting of our kindred organization in the U.S., the Air Pollution Control Association, took place in June in Detroit, Michigan. The papers presented and discussed covered a wide field and numbered no less than 106. We have received from the Association a set of the papers as published, together with a complete set of abstracts. As before, we are listing below the titles and authors of a selection of the papers likely to be of most general interest to our readers. The papers, and the abstracts, are available for reference in the Society's library, and photostat copies can be supplied by arrangement.

In the list following the figures in brackets are the Association's own reference numbers.

Recent Trends in Federal Legislation on Air Pollution. B. Jones, U.S. Dept. H.E.W., Washington 25, D.C. (63.1)

The Understanding of Toxic Effect. F. Princi, Univ. of Cincinnati, Cincinnati, Ohio (63.2)

The Understanding of Cause of Disease. R. A. Prindle, U.S. Public Health Service, Washington, D.C. (63.3)

Public Policy Issues in Air Conservation. J. P. Dixon, Antioch College, Yellow Springs, Ohio. (63.4)

Advances in Continuous Air Pollution Analyzers. G. A. Rost and D. J. Swartz, Beckman Instruments, Inc., Fullerton, Calif. (63.9)

Mechanical Collectors. C. A. Gallaer and J. W. Schindeler, Buell Engineering Co., Inc., New York, N.Y. (63.11)

Dust Scrubber Design—A Critique on the State of the Art. K. Semrau, Stanford Research Institute, South Pasadena, Calif. (63.13)

Electrostatic Precipitators. J. S. Lagarias, Koppers Co., Inc., Pittsburgh, Pa. (63.14)

Bronchial Asthma Associated with Air Pollutants from the Grain Industry. D. W. Cowan, H. J. Thompson, H. J. Paulus and P. W. Mielke, University of Minnesota, Minneapolis, Minn. (63.15)

Influence of Environmental Factors in Chronic Bronchitis. A. M. Phillips, National Steel Corp., Weirton, W. Va. (63.16)

A Field Investigation of Fluorosis in Cattle. H. C. Wohlers, Bay Area Air Poll. Control District, San Francisco, Calif. and G. Newell, Stanford Research Institute, Menlo Park, Calif. (63.18)

Air Pollution from Coal Refuse Disposal Areas. V. H. Sussman and J. J. Mulhern, Pa. Department of Health, Harrisburg, Pa. (63.23)

The Hydrocarbon Content of Urban Air. A Six-Month Survey. R. G. Reynolds, T. Teichman and J. L. Monkman, Dept. of National Health and Welfare, Ottawa, Canada. (63.28)

Emissions from Coal-Burning Power Stations. S. T. Cuffe and R. W. Gerstle, U.S. Public Health Service, Cincinnati, Ohio; A. A. Orning and C. H. Schwartz, U.S. Bureau of Mines, Pittsburgh, Pa. (63.48)

Present Understanding of Effects Upon Health. E. J. Cassell, Cornell University Medical College, New York 21, N.Y. (63.60)

The Nature of Ambient Air Quality Standards. W. L. Faith, Consulting Engineer, San Marino, Calif. (63.63)

Review of Existing Standards. A. C. Stern, U.S. Public Health Service, Washington, D.C. (63.65)

Faults, Limitations and Disadvantages in Air Quality Standards. R. A. Kehoe, The Kettering Laboratory, Cincinnati, Ohio. (63.66)

IRELAND

We have received the third annual report, by F. E. Dawson, Superintendent Health Inspector, Department of Local Government, Dublin, on observations on air pollution in the Republic for the year to December 31, 1961. Recording stations increased by nearly 50 per cent during the year and there were 21 deposit gauges and 15 lead peroxide instruments in operation in six different areas. It is considered that the period over which observations have been taken is still too short for any conclusions to be made or trends determined. Further extension of the investigation is likely to make use of daily smoke and SO_2 recorders.

REPORT FROM NEW ZEALAND

The Fourth Annual Report of the Chief Chemical Inspector for New Zealand is an account of the efforts made by a modest team of two chemical inspectors, one technical officer and a laboratory technician to carry out a directive of that country's Minister of Health which is a model of its kind:

> "A national policy on air pollution control should be designed to allow industrial and urban development of this country to proceed in such a way that the loss to the community of the amenity of fresh unpolluted air is minimized and no recognizable danger to health is created."

The team or department has statutory functions under Part V of the Health Act of New Zealand 1956 and the Air Pollution Regulations of 1957 which broadly duplicate those of the British Alkali Inspectorate and provide for control of potential air pollutants discharged from industries that form a very important though limited part of the total and growing sources of air pollution in the country.

The report emphasizes that the efforts made by the department to stimulate public awareness both of the problems involved and the assistance that can be given in solving them by the increasing experience and technical resources of the Chemical Inspectors.

A small laboratory is maintained in Auckland and measuring equipment is available for loan.

1962 is reviewed and reference is made to the virtual total cessation of 'fumes' incidents in Auckland, a long-standing nuisance caused by frequent weather inversions trapping a concentrated mixture of urban pollutants, trade effluent gases and attendant hydrogen sulphide produced in the disposal of wastes from New Zealand's disproportionately large-scale, agriculture-based industry in what is the largest conurbation in the country.

Surveys carried out refer to "complaints due to short duration peaks of smoke mainly from domestic fires" and the categoric assertion is made that "the only real solution is to stop using smoky and high sulphur fuels for domestic heating". The installation of approved appliances to replace conventional fires is recommended as a means of achieving "some slight improvement".

Geothermal gas in the tourist area of Rotorua has caused three deaths and the sinking of steam bores in the Wairakei area is referred to as constituting a gas hazard if improper use, construction or maintenance occurs.

The rapid growth of industry in what is basically an urban community presents many problems. Superphosphate fertilizer production continues to increase with the need for greater exploitation of the soil and the production of close on 1½ million tons annually results in gaseous discharges that are not quickly dispersed.

The construction of New Zealand's first oil refinery, animal products works, pulp and paper works, a new iron and steel rolling mill, aluminium works and gas works, all pose problems and their solution is sought along lines familiar to clean air workers in Britain and in many cases, using identical techniques.

France

CLEAN AIR IN THE PARIS SKIES

An exhibition entitled "Clean Air in the Sky of Paris" was opened to the public at the gate of Versailles from May 22, to June 3, 1963, under the auspices of the municipality of Paris and the patronage of the Minister of Public Health. The organization responsible for arranging the exhibition, was the Directing Committee for Fight Against Atmospheric Pollution, which is subsidized by the Paris Municipal Council and professional research associations.

The object of the exhibition was to show the causes and nature of atmospheric pollution in Paris, to describe the work of prevention which had been undertaken by the Paris Prefecture in the preceding three years and to suggest various ways in which the population as a whole could co-operate in order to mitigate air pollution.

The organizing committee took the rather unusual step of commemorating the occasion of the exhibition by striking handsome bronze medals and presenting them to various bodies—including the National Society for Clean Air. The medal, in the translated words of the organizers, "symbolizes the will to devote themselves with zeal to that task, essential to the health of the inhabitants and for the preservation of historic buildings and land heritage. It is a sign of hope: may the good air of our Ile de France be breathed as formerly, in the very heart of the capital! Let Paris again become that city 'adorned in white' of which the poets sang!"

French Action on Diesels

The Minister of Health and Population, M. Raymond Marcellin, has announced that measures will shortly be taken against diesel lorries observed emitting black smoke. An instrument for measuring the opacity of the smoke will be used by control inspectors and offending vehicles will be sent to a centre and be immobilized until put into good order at the expense of the proprietor.

Dr. D. T. A. Townend, who retired as Director General of the British Coal Utilization Research Association last year, gave the 12th Coal Science Lecture, instituted by the Association, in London on October 16. His subject was "Some Reflections on Combustion".

News from the Divisions

The **West Midlands Division** held their autumn sessional meeting at the Berkeley Arms Hotel, Berkeley, Gloucestershire on September 17. Forty members were the guests of the Midlands Electricity Board at a luncheon that followed the meeting and for a visit to the Berkeley Nuclear Power Station which was arranged with the co-operation of the South Western Region of the C.E.G.B.

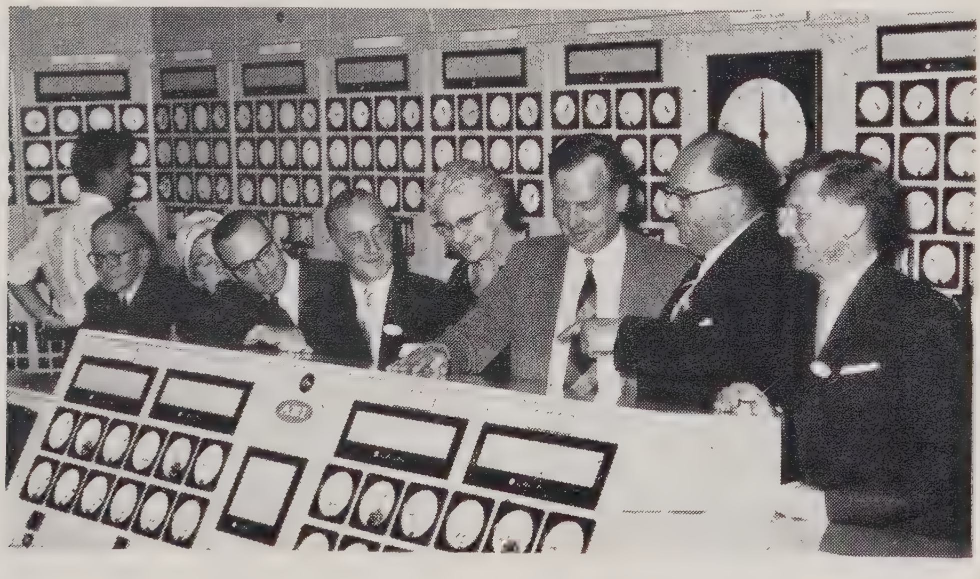
During the meeting Mr. J. P. Montgomery, Assistant Chief Commercial Officer of the Midlands Electricity Board, spoke on developing trends in electricity usage and referred to the 23 per cent increase in domestic consumption during the past year. There was, he said, a definite turn towards electric heating and the advent of electric storage heating with the advantage of lower charges had opened up new prospects for the future, in particular absence of smoke, fumes and smell, no handling or ordering of fuel, no ash disposal and low running costs.

Mr. Montgomery emphasized that local authorities should have no reservations about electrical heating installations because of supply problems. The establishment of many more smokeless zones and increased use of electricity for all purposes, including cooker, water heating and space heating was unlikely to be an embarrassment in the Midlands. On the contrary, he said, increased usage would help to stabilize electricity prices.

Councillor F. V. Magness, Divisional Chairman, presided at the meeting and the luncheon, at which he expressed thanks to their hosts.

South East Division members were present at the funeral of their late Secretary, Mr. J. J. Matthews on September 19, and his dedicated services to the Division were recalled by many amongst the large group of members who attended the last of the Divisional visits for 1963, to Tilmanstone Colliery in Kent as the guests of the National Coal Board.

Northern Ireland Division. On October 17, the President, Dr. Albert



The West Midlands Division at the Berkeley Nuclear Station. Left to right: J. K. Best, Cllr. Mrs. Reynolds, W. L. Kay, Mrs. R. Ilsley, J. P. Montgomery (MEB), Cllr. F. V. Magness, and C. Nield (MEB)

Parker, attended the Annual General Meeting of the Division in the Belfast City Hall, at which the present officers of the Division were re-elected. Mr. R. Campbell Brown was appointed Vice-Chairman and five additional members were added to the Divisional Council. The meeting approved of a draft constitution.

Following the Annual General Meeting a public meeting was held presided over by Councillor Miss Irene M. E. McAlery, J.P., Chairman of Belfast County Borough Health Committee. This meeting was attended by representatives of Local Authorities, the Northern Ireland Hospitals Authority, other public bodies and members of the Society. The title of Dr. Parker's Address was "Steps Towards Clean Air" which was greatly appreciated by those present. Later in the afternoon the President appeared in an interview on B.B.C. Television.

The **North West Division** met jointly with the West Lancashire and Cheshire Regional Smoke Abatement Committee on Thursday, 31 October.

As a practical manifestation of the Division's intention to demonstrate its interest and concern in Merseyside's air pollution problems, Liverpool was chosen for the meeting and a large, representative gathering assembled in the Walker Art Gallery.

Councillor Barnes of Blackpool, Divisional Chairman, presided and the principal speaker was Dr. P. J. Lawther, Director of the Air Pollution Unit, Medical Research Council.

By means of a series of colour slides Dr. Lawther explained the physiological effects of inhaled pollutants and warned his audience that any attribute of any aspect of urban living must be suspect when considering the plight of the bronchitic and he went on to remind his audience that foul and polluted air was a totally unjustifiable affront to civilized living and should be eradicated because of its beastliness if for no other reason.

NEW PUBLICATIONS

Among many other publications received by the Society mention must be made of the following:

Proceedings of the U.S. National Conference on Air Pollution, 1962, U.S. Dept. Health and Welfare. Public Health Service. 4to., 436 pp. The papers presented at this conference were reviewed in *Smokeless Air*, Spring, 1963.

Symposium on Mineral Dust in Industry, held at the British Ceramic Research Association, December 1961, 8vo. 153 pp. H.M.S.O., for the D.S.I.R. The report includes the fifteen papers read at the conference, together with the Chairman's summing up.

From the U.S. Public Health Service come two excellent handbooks on *Air Pollution Aspects of the Iron and Steel Industry*, and *Emissions from Fuel Oil Combustion.*

The Organization for Economic Co-operation and Development (O.E. C.D.) has published a report on *Air Pollution in the Iron and Steel Industry*, An important survey, it has been prepared by a group of European experts, including three from the United Kingdom.

Richard A. Prindle

Dr. Prindle, whose name will be familiar to many in this country, has been awarded the U.S. Public Health Service's Meritorious Service Medal for "outstanding contributions to the successful development of a national air pollution programme".

Dr. Prindle is Chief of the Division of Public Health Methods in the Public Health Service and since 1957 he has held key posts in the Federal air pollution programme and until he assumed his present assignment last April was Deputy Chief of the Division of Air Pollution. It will be recalled that Dr. Prindle flew out at short notice last December to make on-the-spot observations of the London smog.

Analysing the Ratcliffe Power Station Inquiry

By ALAN GILPIN, B.Sc.(Econ.), M.Inst.F., M.A.P.H.I.

The following article, reproduced by kind permission from "The Municipal Journal", reviews the public inquiry into the proposed building of a large power station. From the clean air point of view more electricity generation is urgently needed—provided of course that there are adequate safeguards against local pollution, which here it was found was the case.

APPLICATION to the Minister of Power for consent to build a new 2,000 mw. power station in south Nottinghamshire was first made by the Central Electricity Generating Board in March 1960, when a station at Holme Pierrepont was proposed.

This application was rejected after a public inquiry, and subsequently, in June 1962, the C.E.G.B. applied for consent for a similar station at Ratcliffe-on-Soar. A further public inquiry was held in Nottingham in January into the board's proposals for Ratcliffe.

The inquiry, which lasted 14 days, was conducted by Mr. W. L. M. French, deputy chief engineering inspector, Ministry of Power, and Mr. D. F. Offord, principal planning inspector, Ministry of Housing and Local Government. Dr. A. E. Martin, a senior medical officer, Ministry of Health, attended as medical assessor.

In all, 84 written objections were submitted, together with a protest petition signed by 5,763 people, mostly residents of Long Eaton or users of the recreational area of Trent Lock. The objectors included Nottingham City Council, Beeston and Stapleford Urban District Council, Long Eaton Urban District Council and Gotham Parish Council. Supporters of the board's application included Nottinghamshire County Council and the National Coal Board.

The case for the generating board rested upon three main arguments:

The rate at which the demand for electricity was increasing in this country was such that by the late 1960s the C.E.G.B. would be faced with a power station construction programme amounting to some 5,000 mw. of new generating plant each year.

If coal is to compete successfully with other fuels it must not only be utilized with the maximum efficiency but coal-fired generating stations must be located on the most economic sites. The site at Ratcliffe was most desirable because of the availability of cooling water and because of short and economical hauls of East Midlands coal. About five million tons of coal a year would be burned.

The operation of the power station would not produce any significant increase of pollution at ground level which would be harmful to health, and that, in particular, the contribution from the station would be minimal in conditions of fog or inversion. The generation of electricity in large modern power stations in fact made a great contribution towards clean air. The power station would have a single chimney 650 ft. in height and the waste gases from the boiler would pass through mechanical arrestors and electrostatic precipitators for the removal of grit and dust at a minimum collecting efficiency of 99·3 per cent, before being discharged from the chimney at a speed of nearly 50 m.p.h. The hot gases would rise as a result of buoyancy to a height of nearly 2,000 ft. under normal atmospheric conditions.

Clean Air Aspects

On the clean air aspect of the case the objectors argued that the good work being done by various local authorities under the Clean Air Act to improve air conditions would be nullified by the dust and sulphur oxide (SO_2) contained in the chimney emissions, and furthermore there was a risk to the health of the people, especially in times of fog or temperature inversion.

It was claimed that the assessment made by the C.E.G.B. of the effect of atmospheric pollution was unsatisfactory because:

(*a*) there was no 2,000 mw. power station in operation and all calculations were estimates unsupported by measures of actual conditions; estimates were extrapolations of figures obtained from small power stations.

(*b*) there was insufficient knowledge of what might happen during certain meteorological conditions.

The findings of the inspectors and the medical assessor covered all aspects of the chimney emissions—smoke, grit and dust, and sulphur dioxide.

In respect of smoke, the inspectors concluded that because of the complete combustion that would be achieved at the proposed power station, no smoke would be emitted from the chimney apart from short periods during starting the boilers from cold. Soot and carbonaceous matter emitted from domestic and many industrial chimneys are known to contain traces of substances capable of producing cancer, but as these would be absent from the power station chimney emissions, the medical assessor was able to conclude that fears in this respect were groundless.

Under the provisions of the Alkali, etc., Works Regulations Act, 1906 (as extended by the Alkali Works Order, 1958) the C.E.G.B. is under the jurisdiction of the chief alkali inspector of the Ministry of Housing and Local Government in matters relating to the emission of grit and dust from power stations, and he must be satisfied that the best practicable means are being employed to render these emissions innocuous before issuing a certificate authorizing the operation of the power station.

It was calculated for the new station that with an average wind speed there would be a deposition of dust of about 3½ grammes/100 sq. metres/month (about 0·1 tons/sq. mile/month). This would fall to the ground some two to three miles from the power station in the direction of the prevailing wind. These calculations were not challenged by the objectors, but it was argued that the guaranteed collecting efficiency of the arresting plant of 99·3 per cent might not always be attained.

The inspectors agreed that from an engineering standpoint it was impracticable for the board to give an assurance that an efficiency of 99·3 per cent would be achieved at all times. But in the event of arrestor efficiency showing signs of falling off, the board would consider reducing load on the plant (although this remedy would obviously be difficult to apply at a time of shortage of electricity supply). The board hoped in quite a short time to perfect a monitoring device to give regular readings of dust emission. Deposit gauges would be sited in the vicinity of the station.

The medical assessor noted that a certain amount of grit and dust would be emitted but concluded: "This, however, is an inert material and the quantity inhaled by persons in the vicinity of the station would not have any effect on health."

The coal for Ratcliffe power station will be drawn from a number of collieries in the East Midlands—it has been estimated that the average sulphur content will be approximately 1 per cent. With an average wind speed, the short-term concentration of sulphur dioxide from the power station chimney (that is, for three minutes) was estimated by the board to be 15 parts per 100 million at a point of maximum concentration about six miles from the power station. This calculated figure is subject to a factor of 2 (it could be increased by 100 per cent or decreased by 50 per cent). The estimated general increase of SO_2 in the urban districts around the power station was of the order of 0·5 parts of SO_2 per 100 million.

The board's calculations were not challenged by the objectors. The validity of the calculating methods was supported by actual measurements around Castle Donington and High Marnham power stations. The medical assessor concluded that "no hazard to health is to be anticipated from an increase such as this".

There was a conflict of expert evidence relating to the possibility of a high concentration of the gas at ground level during times of inversion or at the end of a period of inversion. The C.E.G.B. submitted that at all times of fog or inversion, the emissions from the chimney would rise above these conditions to where the air would be rarely still and the concentration of gas would be dispersed before it could be brought down to ground level.

The inspectors reported: "We have come to the conclusion that the evidence given by the C.E.G.B. at this inquiry should generally be preferred and that any above normal concentrations of SO_2 from the proposed chimney, for long and short periods, would be unlikely to occur at ground level."

The medical assessor reached similar conclusions: "If the board's contentions regarding chimney emissions are accepted, as I believe they must be, the plume would make no contribution to pollution by sulphur fumes at ground level at times when there is high pollution from other sources such as during fogs and times of temperature inversions, and the maximum pollution from the power station would occur at times when pollution from other sources is lower on account of the rapid dispersion by strong winds."

The medical assessor, commenting on bronchitis as the disease most commonly associated with atmospheric pollution, said that there is no cause to fear that the power station would affect the incidence of bronchitis in the area; neither would it affect the condition of established cases or the mortality from this disease.

Summing up, Dr. Martin stated: "After consideration of the existing knowledge of the medical effect of atmospheric pollutants, and of the concentration of pollutants which would reach ground level from the proposed power station at Ratcliffe-on-Soar and be superimposed on the existing level of atmospheric pollution in the area, I am of the opinion that the power station emissions would not add any appreciable hazard to the health of the surrounding population."

The inspectors concluded in the light of all the evidence that the objectors concerned had not justified their submission that a power station of the size proposed should be sited as far as possible from the urban areas at and near Nottingham on the grounds of possible atmospheric pollution.

After careful consideration of all the circumstances and after consultation with the Ministers of Housing and Local Government and Health, the Minister of Power has consented to the erection of the station. Work will be begun on the site within the very near future, so that the first unit should be in service for the winter of 1967-68.

Since approving the C.E.G.B.'s proposals for Ratcliffe, the Minister has approved a similar power station near Widnes.

Warwickshire Clean Air Council

The sixth annual report of the Council is an informative document, containing the reports of the Technical Committee and of the Analyst, W. M. Lewis, in charge of the co-ordinated pollution measurements in the county, and tables of the measurements themselves. There is also an appendix by Dr. D. Livingstone, M.O.H. for Leamington Spa, of reflections on the W.H.O. report "Epidemiology of Air Pollution", and a note on the supply and suitability of smokeless fuels for the open fire by K. P. Llewellyn, C.P.H.I. for Nuneaton.

Control of Air Pollution

By Alan Gilpin, *B.Sc.(Econ.), M.Inst.F., M.A.P.H.I.*

514 pages • **162 illustrations** • **120s**

This book is written especially for local government officers, industrial users of oil, solid fuel, gas and electricity, and candidates for the Public Health Inspector's Diploma and the Smoke Inspector's Diploma. The need for a textbook dealing with the practical implementation of the Clean Air Act has long been felt, and the author, who has wide experience of its application to both industry and domestic dwellings, is well qualified to assess past progress and future problems.

After an introductory section reviewing the nature, effects and measurement of air pollution, Mr. Gilpin covers different types of furnaces, fuels and firing methods. He then studies in detail the practical application of the Clean Air Act, including smoke abatement, grit and dust arrestation, chimney heights, smoke control areas and domestic appliances, railways and vessels, and finally deals with other major problems, those of the iron and steel industry, ceramics, power stations, atomic energy, motor vehicles and odour control. In each case the responsibilities of local authorities and Chief Public Health Inspectors are fully examined, and a chapter is devoted to the important role of the Alkali Inspectorate.

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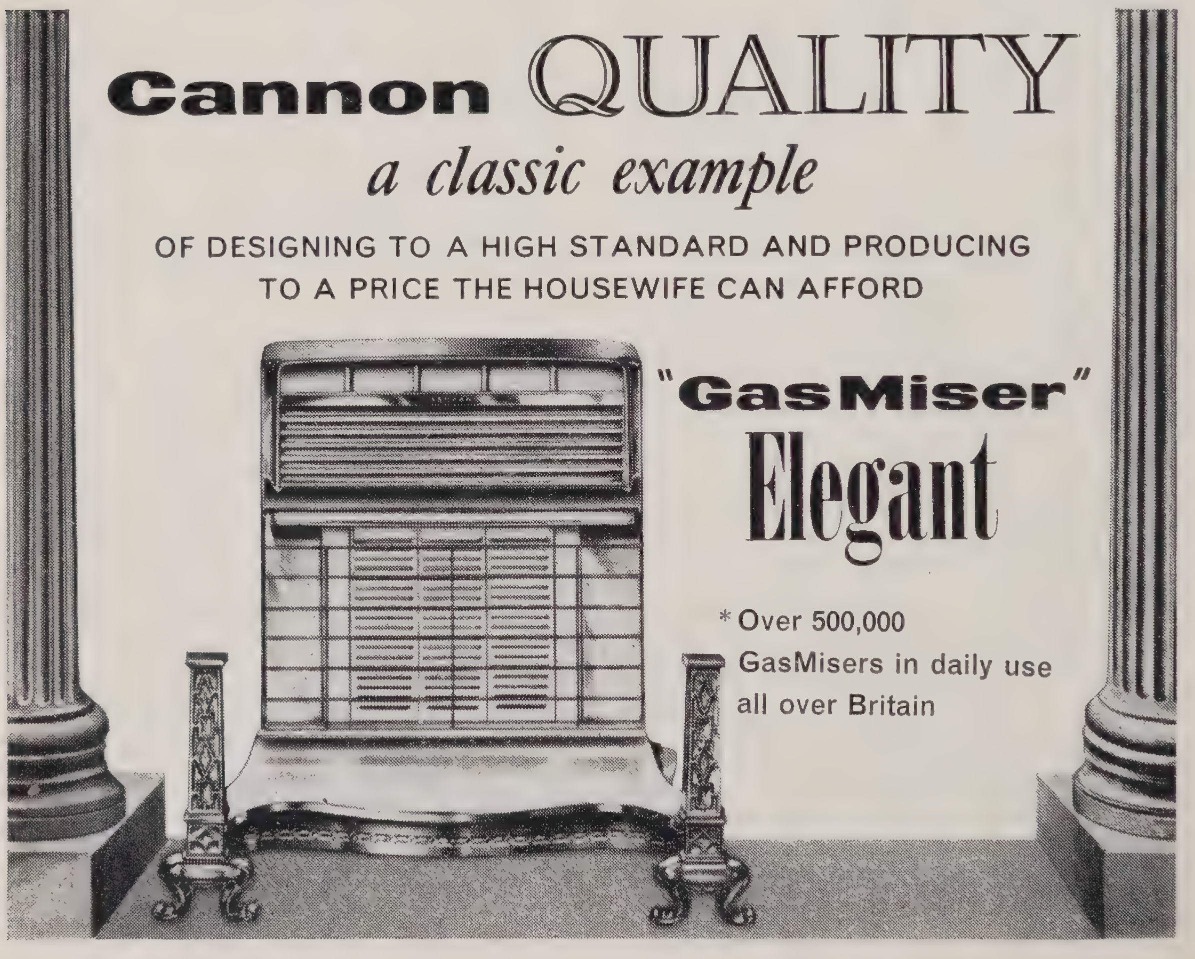

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The Control of Air Pollution

Important New Book

The Control of Air Pollution, by Alan Gilpin, B.Sc. (Econ), M.Inst.F., M.A.P.H.I., pp. 514, Royal 8vo. London, Butterworths. 120s.

THIS new text book is to be commended without reservation. It brings together, in one well-printed and amply illustrated volume, all the practical information that is indicated by its title. Its purpose, writes the author, "is to provide a textbook dealing with the practical application of the Clean Air Act and allied legislation, and has been written with the day-to-day requirements of Public Health Inspectors constantly in mind." It will certainly also meet requirements for information from many others concerned with fuel and compliance with the Act.

The nature and effects of air pollution are dealt with succinctly, and for a book of this nature, adequately, and the author moves quickly on to the principal sections—first, a series of chapters of a technical nature on furnaces, fuels and firing methods; then a section on the practical applications of the Clean Air Act, including chapters on smoke control areas and on domestic appliances and conversions. The fourth and final part of the book rounds off the survey with chapters on iron and steel, ceramics, cement, lime and glass, conventional power stations, atomic energy and odour control.

The book deserves praise for the systematic and orderly examination of the whole problem, and the clear way in which its aspect is presented and discussed. It is a big book, perhaps the longest solo work there is on air pollution, but there is no wordiness about it. There is nothing that is merely academic and only slight reference to the background—the history of air pollution in Britain, for instance, is given less than a page—which, in a book on control is just as well.

Inevitably, the time lag between completing the manuscript of a work on a subject that is constantly changing, means that there is always something new that is absent. In this case it is the new smokeless fuel situation, but, for a major production there are many references of quite recent date, including the recent memorandum on chimney heights. The book, incidentally, is well referenced, chapter by chapter, and the index—often a weak spot—must be given top marks.

A reviewer who has some understanding of the reading, searching, selecting, and finally writing, involved in tackling this many-sided question of air pollution, must pay tribute, not only to the skill revealed and the success achieved, but to the terrific amount of hard labour that the author has obviously put into his task. Mr. Gilpin dedicates the book to his wife, and our guess would be that she deserves it.

Grit and Dust Removal

Mechanical Equipment for Removing Grit and Dust from Gases, by R. Jackson, Ph.D., F.Inst.P., F.Inst.F. 284 pp., med. 8vo. Leatherhead, Surrey: British Coal Utilization Research Association. 50s. (plus postage, 1s. 4d. in U.K.)

THIS is another important and practical textbook. It is a collection in one volume of a series of reviews that have been published in the B.C.U.R.A. *Monthly Bulletin.* It is intended for engineers "and others concerned with implementing those sections of the Clean Air Act that deal with emissions of grit and dust".

It is a remarkably thorough and practical textbook, but as the title indicates, it is concerned only with mechanical equipment. The important electrostatic precipitator is not included in the studies.

The first chapter discusses air pollution from boilers and the selection of collectors. Then follow chapters on settling chambers, mechanical dust collectors of low and medium efficiency, the flow problem in cyclones, high efficiency cyclones (return flow and uni-flow types), combinations of collectors, and finally a review of performance.

The volume is well illustrated, and the references at the end of each chapter are extensive. There is also a lengthy supplementary bibliography.

The comparatively recent "uni-flow" or straight-through type of cyclone is described and compared with designs in common use, and there is discussion on attempts that have been made to improve the performances of simple cyclones by changes in shape or to overcome specific problems.

Variations in Emissions

The first chapter discusses the effect of various factors on emission from chain grate stokers, and refers to four: increasing load giving increasing rate of gas flow, with increasing emission of solids; increasing the load and the gas velocity increases the percentage of coarse material in the emission; with a given coal increase in the percentage of fines increases the rate of emission; and moistening by controlled addition of water leads to considerable reduction in emission. Graphs are given showing how these factors affect emissions and show the wide range not only of amounts but also of the nature of the emission that is possible from a single boiler.

The text continues: "In the selection of a collector it is also desirable to know not only the level of emission but also the extent to which these need to be reduced. The requirements of the Act are not precise, and since increasing collector efficiency is bought at increasing cost, there is much room for discussion and personal opinion.

"At the time of writing there do not appear to be sufficient data to take a general view. But experience with the experimental boiler at Leatherhead indicates that, with good practice and a reasonable fuel, grit emission even at full load need not be excessive. Since this boiler has been used for experimental testing often under abnormal conditions its performance cannot be regarded as that of a typical normally-operated industrial boiler. Nevertheless, despite its wide range of running conditions, the emission figures for operation at about maximum continuous rating (M.C.R.) lie in a band between 0·3 and 1·0 per cent of the fuel fired. There seems little reason why other boilers should give emissions much higher than this.

Nuisance Levels

"To obtain an estimate of the nuisance level of this rate of emission it can be compared with such ordinances as already exist. For example, the New York City ordinances lay down a maximum permissible level of 1·9 lb. emission per million Btu. of fuel for boilers of this size Changing this figure, by a reasonable conversion factor, into the unit previously used, this corresponds to 1 per cent of the fuel fired On this basis the Leatherhead boiler, and presumably most industrial boilers, do not need to be fitted with gas cleaners However, under the worst conditions, the margin of error is small and it may be desirable to fit some form of grit collector to guard against accidental mal-operation "

WEST RIDING'S BIG CAMPAIGN

The West Riding Clean Air Advisory Council has embarked on an ambitious campaign of publicity and education throughout its area during the present winter months. It is taking the form of a travelling exhibition that consists of four mobile commercial exhibitions and one mobile technical exhibit by the Advisory Council itself.

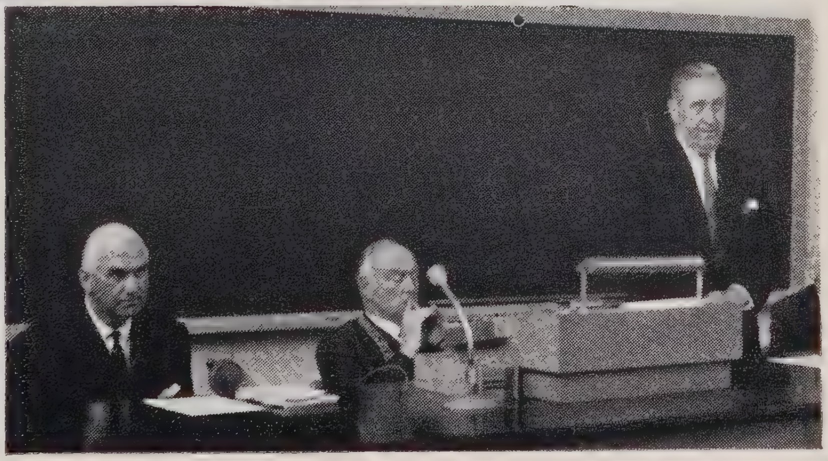
The commercial exhibitors, each with its own specially designed openable caravan, are the Solid Smokeless Fuels Federation, the Yorkshire Electricity Board, the North Eastern Gas Board, and the National Coal Board with the Coal Utilization Council.

The campaign opened at Leeds on September 17, and will end in March next, visiting no less than 56 towns.

The exhibition was given a ceremonial opening at Leeds with a gathering in the Holdsworth School of Science, close to the site of the exhibition at Woodhouse Moor. The Lord Mayor of Leeds presided, and the opening was performed by Sir Donald Kaberry, M.P., one of the Leeds members. There was a good audience of representatives of local authorities and of guests, and the campaign was given an excellent send-off.

The arrangements for the long tour have been carefully planned and the co-operation of the fuel organizations throughout has been assured. The Advisory Council, under its energetic officers and committee, including its chairman, Mr. E. J. Winfield, and its honorary secretary, Professor D. B. Bradshaw, have done a notable job of work in organizing the campaign and other areas could do worse than take a leaf out of Yorkshire's book.

General view of the first exhibition, in Leeds, after the opening ceremony



At the official opening of the campaign. Mr. Winfield proposing a vote of thanks to Sir Donald Kaberry, M.P. (at left), with the Lord Mayor of Leeds in the Chair

SMOKE CONTROL AREAS

Progress Report

POSITION TO OCTOBER 1, 1963—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation . .	44	1
Acres, 3,400 . .		
Premises, 41,060		
Smoke Control Areas in Operation	1,181	38
Acres	*239,208*	*17,843*
Premises	*1,341,112*	*80,617*
Smoke Control Orders		
Confirmed	213	4
Submitted	122	7
Grand Totals	1,560	50

The lists below are supplementary to the information in the last issue of Smokeless Air (Autumn, 1963), which gave the position up to July 1, 1963. They now show the changes and additions to October 1, 1963.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Areas in Operation

Aireborough U.D. Nos. 12 and 13, Aldridge U.D. Nos. 15 to 17, Barnet U.D. No. 4, Beckenham B. No. 2, Beddington & Wallington B. No. 3, Bermondsey M.B. No. 5, Bexley B. No. 1, Bingley U.D. Nos. 5 and 6, Birmingham B. Nos. 81 and 82, 86 to 88, Brentwood U.D. No. 3, Brierley Hill U.D. Nos. 12 to 14, Camberwell B. Nos. 4 and 5, Carshalton U.D. No. 3, Chatham B. No. 2, Cheshunt U.D. No. 3, Church U.D. No. 3, Colne B. No. 2, Coventry C. B. No. 4, Crawley U.D. No. 4, Dartford B. No. 4, Darwen B. No. 1, Deptford B. Nos. 4 and 4A, Doncaster C. B.No. 7, Droylsden U.D. No. 8, Dudley C.B. No. 5, Dukinfield B. No. 5, *Ealing B. No. 12, East Barnet U.D. No. 4, Eccles B. No. 4, Edmonton B. No. 5, *Exeter B. No. 4, Exeter B. Nos. 5 and 6, Feltham U.D. No. 3, Finchley B. Nos. 7 and 8, Finsbury M.B. No. 4, Friern Barnet U.D. Nos. 3 and 4, Fulham M.B. No. 7, Grantham B. No. 7, Gravesend B. No. 1, Greenwich M.B. Nos. 4 and 5, Halesowen B. No. 18, Hampstead B. No. 5, Harrow B. No. 5, Hayes & Harlington U.D. No. 20, Hornchurch U.D. No. 5, Heckmondwike U.D. No. 3, Hendon B. Nos. 4 to 6, Heston & Isleworth B. Nos. 5 and 6, High Wycombe B. No. 11, Huddersfield C.B. No. 5, Ilford B. No. 4, Kensington M.B. No. 6, Kingston-upon-Hull C.B. No. 10, Kingston-upon-Thames B. No. 3, Lambeth M.B. No. 6, Leicester C.B. Nos. 8 and 9, *Leigh B. No. 2, Leigh B. No. 3, Lewisham M.B. No. 13, Malden & Coombe B. No. 3, Manchester C.B. Nos. 6 and 7, Merton & Morden U.D. No. 3, Middlesbrough C.B. No. 3, Mirfield U.D. No. 5, Morley B. No. 21, Nottingham C.B. No. 3, Oldbury B. No. 2, Oldham B. No. 2, Ossett B. No. 4, *Penge U.D. No. 2, *Preston C.B. No. 6, Queensbury & Shelf U.D. No. 2, Richmond (Surrey) B.

No. 4, Rotherham C.B. No. 12, Rothwell U.D. Nos. 1 and 2, Royton U.D. No. 3, *Runcorn U.D. No. 2, St. Marylebone M.B. No. 6, St. Pancras M.B. Nos. 4 and 5, Sale B. No. 4, *Sedgley U.D. No. 7, Seisdon R.D. No. 1, Skipton U.D. No. 1, Slough B. No. 4, Smethwick C.B. No. 5, Southgate B. No. 3, Stalybridge B. No. 6, Stanley (Durham) U.D. No. 1, Stepney M.B. No. 4, Stoke Newington B. Nos. 8 and 9, *Stourbridge B. Nos. 1, 7 and 9, Stourbridge B. Nos. 2 to 6, 8, 10 to 17, Todmorden B. No. 2, Twickenham B. No. 2, Wallasey C.B. No. 8, Wandsworth M.B. No. 4, Wanstead & Woodford B. No. 4, Warrington C.B. No. 6, Wembley B. Nos. 6 to 8, West Bromwich C.B. No. 11, Widnes B. No. 2, Wilmslow U.D. No. 11, Winsford U.D. Nos. 4 to 7, Wolverhampton C.B. No. 3, Wood Green B. No. 5, Woolwich M.B. Nos. 15 to 18, Worsley U.D. No. 1.

New Orders Confirmed but not yet in Operation

*Beeston & Stapleford U.D. No. 3, Bingley U.D. Nos. 7 to 9, *Birmingham C.B. Nos. 34 and 85, *Bristol C.B. No. 7, Brentwood & Chiswick B. No. 4, Carshalton U.D. No. 4, Chislehurst & Sidcup U.D. No. 1, *Coventry C.B. No. 5, *Dukinfield B. No. 4, Ealing B. Nos. 14 and 15, Exeter C.B. No. 7, Felling U.D. No. 3, Halesowen B. Nos. 20 and 21, Hammersmith M.B. No. 5, Hayes & Harlington U.D. No. 22, Hendon B. Nos. 7 and 8, Heston & Isleworth B. No. 7, *Huddersfield C.B. No. 6, *Ilford B. No. 5, Lambeth M.B. Nos. 7 and 8, Leeds C.B. Nos. 25 to 37, *Liverpool C.B. No. 16, Malden & Coombe B. No. 4, Merton & Morden U.D. No. 4, Morley B. Nos. 25 to 27, Ossett B. Nos. 7 and 8, Poplar M.B. No. 15, Pudsey B. No. 4, *Sedgley U.D. No. 8, *Southampton C.B. No. 2, Stourbridge B. No. 19, Sutton Coldfield B. No. 1, Swinton U.D. Nos. 2 to 5, Walsall C.B. Nos. 5 and 6, Walthamstow B. No. 7, Wolverhampton C.B. Nos. 4 and 5.

New Orders Submitted for Confirmation but not yet Confirmed

Ashton-under-Lyne B. Nos. 2 and 5, Barking B. No. 6, Barnes B. No. 4, Bebington B. Nos. 9 and 10, Beddington & Wallington B. No. 4, Birmingham C.B. Nos. 95 to 101, Blackburn R.D. No. 1, Bradford C.B. No. 5, Brierley Hill U.D. No. 15, Cheadle & Gatley U.D. No. 6, Chesterfield R.D. No. 4, Colne B. No. 3, Coventry C.B. No. 6, Dagenham B. No. 6, Dartford B. Nos. 5 and 6, Deptford M.B. Nos. 5 and 6, Droylsden U.D. No. 9, Dudley B. No. 6, Edmonton B. No. 6, Feltham U.D. No. 4, Fulham M.B. No. 8, Hampstead M.B. No. 6, Harrow B. No. 7, Heckmondwike U.D. No. 4, Huddersfield C.B. No. 8, Keighley B. No. 4, Kensington M.B. No. 7, Kidsgrove U.D. Nos. 1 to 7, Leeds C.B. Nos. 38 and 39, Leicester C.B. Nos. 10 and 11, Lewisham M.B. Nos. 14 to 17, Leyton B. No. 4, Malden & Coombe B. No. 5, Merton & Morden U.D. No. 5, Mold (Wales) U.D. No. 1, Newcastle upon Tyne C.B. No. 11, Padiham U.D. No. 7, Prestwich B. No. 7, Richmond (Surrey) B. No. 5, Rothwell U.D. No. 6, St. Marylebone M.B. No. 7, Sale B. No. 5, Sheffield C.B. No. 15, Shoreditch M.B. No. 6, Slough B. No. 6, Southgate B. No. 4, Stockton-on-Tees B. No. 1, Stoke-on-Trent C.B. No. 13, Sutton Coldfield B. No. 2, Wanstead & Woodford B. No. 5, Watford B. No. 4, Wembley B. No. 9, West Bromwich C.B. Nos. 12 and 13, Westhoughton U.D. No. 3, Wimbledon B. No. 3, Wolverhampton C.B. No. 6, Woolwich M.B. No. 19, Worsley U.D. No. 3.

SCOTLAND

New Smoke Control Orders in Operation

Barrhead No. 1 (Arthurlee), Clydebank No. 3, Dundee (West End), Edinburgh (Corstophine No. 2), Glasgow (Provan, Part B), Paisley (Foxbar).

New Smoke Control Orders Submitted for Confirmation but not yet Confirmed

Coatbridge (Kirkshaws), Paisley (Gallowhill).

Smoke Control Order Suspensions

Among local authorities which are considering delays or suspensions of smoke control orders because of present uncertainties of future fuel supplies, are Nuneaton, Dukinfield, Solihull and Shrewsbury.

Golden Jubilee

Hearty congratulations to Lodge-Cottrell Ltd. on the occasion of their Golden Jubilee. A commemorative brochure on the company's fifty years of progress in the field of dust, grit and fume arrestment has been issued to mark the celebration.

Air Pollution — The Human Problem

By Mary Catterall, M.B., B.S., D.M.R.T.

A paper by Dr. Catterall with this title presented at the Scarborough Conference, was included in the Preprints and will be reprinted, with discussion, in the Conference *Proceedings*, to be published shortly. In presenting her paper Dr. Catterall read what was in effect a completely new address, spirited, in places controversial, and very human. As this will not be included in the *Proceedings* it is reproduced here, in full. Dr. Catterall is Research Fellow for Respiratory Diseases, and Senior Registrar in charge of the Respiratory Function Laboratory, the General Infirmary, Leeds.

MR. Chairman, Ladies and Gentlemen, I should like to thank you for inviting me to speak on the Human Problem of Air Pollution. This can be resolved into the effects of dirt on the human being—of breathing dirty air and living in dirty surroundings. It is a sobering thought that this country, which led the whole world into the industrial era, now lags behind with millions of its people breathless and with the highest death rate from bronchitis and lung cancer in the world.

As industry spreads, like a rash, throughout the world there are already signs that bronchitis and lung cancer are increasing also. For instance, Paris—so long the dreamland of glamour and romance—is now seriously troubled by air pollution and rising incidence of bronchitis. The correlation between lung diseases and air pollution by industry, domestic chimneys and cigarette smoke is therefore of extreme importance to the human race and especially so in the densely populated areas.

Today, our industrial towns are black, grim and oppressively ugly, but we say, they are better than they were a hundred years ago, and we close our eyes to their urgent hideousness and the compelling dangers of their atmospheres. We continue to tolerate conditions which are known to cause incurable diseases of the lungs and we lazily expose our children to the risk of contracting bronchitis and lung cancer.

Is this extraordinary attitude born of indifference or ignorance? If it is indifference, then it is criminal. But if it is ignorance it can be remedied by education, and the unflagging production of the evidence against air pollution and by constructive suggestions for improvement. But above all, these *suggestions* must be followed by energetic *action*.

Many people are aware that bronchitis is known as the Englishman's disease because of the very high incidence of the disease in this country. 27,000,000 working days are lost each year through bronchitis and 30,000 people die every year from it. In the industrial North it is so common that people regard it as one of the facts of life. Often when a doctor says to a patient "Have you got a cough?" he'll answer "No". If the doctor then says "Do you bring up any phlegm?" the patient will answer "Yes". If the doctor then replies "Well if you bring up phlegm, you must have a cough", the patient will say "Oh well yes I've got a smoker's cough" or "Oh yes I've got a normal cough". Repeated coughing is not normal and it is not harmless and yet it is so common that people accept disease as normal health. Bronchitis most often hits men in their 40's and 50's—at the height of their working skills and experience. They become breathless and unable to do the work for which they've been trained. They come to dread the onset of winter, when fog and smoke and cold make them suffer from repeated attacks of acute bronchitis. These mean loss of work and eventually dismissal. Sometimes, a change to a lighter job is arranged by a kindly employer and this may postpone dismissal for another few years. Lighter jobs always mean less pay because they are less skilled and the story of a skilled manual worker becoming a sweeper or a night-watchman is so common that it does not even arouse comment—let alone action.

The repercussions of a man becoming a respiratory cripple spread throughout his family—money is reduced and overcrowding is increased by his presence. His cough scatters germs all over the house and small children are at the level of the greatest concentration of the fall-out. Often the mother goes out to work and then there is a deterioration in the appearance of the house—because you must realize that in an industrial town, housework is an absolutely full-time job. Curtains are washed once a month and paintwork every day. The battle which the housewife wages against the falling dirt, the grease and the smoke is an inexorable one from which there is no let up. The housewife may stop working through sheer physical exhaustion or mental frustration, but the dirt keeps falling and the smoke creeps in continuously and relentlessly settles everywhere.

As the home deteriorates, so does the morale. The father is no longer the breadwinner, he has become a wheezing, coughing, out-of-work chap who gets in everybody's way. If he lives in one of the millions of houses, which have no lavatory, he has to wrap up and go out up the road each time he wants to open his bowels. As soon as possible, his children leave school and go out to work and many of them return home as late as possible, preferring life in the grey streets to the noisy irritations of a father with bronchitis.

It is salutary to note that of undergraduates in English universities, Northern schoolchildren are fewer than those from the South. Is this because Northern children are more stupid than those from the South? Or is it because the school child goes out to work instead of staying on at school, because his or her father is no longer a wage earner but a respiratory cripple—unemployable in the Welfare State. Surely an affluent 20th century society should be ashamed? And surely every scientific development should be used to remove the pollution and the conditions which cause bronchitis?

Lung Cancer

This is a disease which is showing a soaring increase and which is known to be closely correlated with cigarette smoking and atmospheric pollution. Remove both of those and you would wipe away pain and heartbreak and anxiety from thousands of men and women. It is a disease which could largely be prevented but which is, at present, and in most cases, incurable. In this country, one person dies from this disease every 20 minutes.

I am going to try to illustrate what it means to a living, working man by telling you the case history of a patient I saw whom I shall call John.

He was a tall man of 41, with black hair and dark brown eyes and very white teeth. He had lived in Leeds all his life and was married and had two young daughters and a baby of six months old. He was a window cleaner and was bright and quick at the job and was doing very well indeed. One day, he noticed that he was rather breathless—"short o' puff" as he put it—on climbing his ladders and carrying them around. He had a slight cough, but then, so has nearly everyone in Leeds, particularly those who, like John, smoked 15 cigarettes a day. So he carried on and booked for the next holidays at Blackpool. But he began to slow down and his wife noticed that he was very tired when he came back in the evenings, his appetite went and his lack of energy made him irritable. One day, one of his coughs produced some phlegm and mixed with the soot and dirt which he was so used to seeing, there was bright red blood. He tried to go on working, but now he was not only tired and breathless but he was scared.

There followed an anxious visit to the doctor and the tedium of waiting in the Hospital Out-patients, then chest X-rays, and examinations of the bronchial tubes. Then came the examination under the microscope of a small piece of tissue from the bronchial tube and the dread report from the pathologist—"Highly invasive cancer with much proliferation of malignant cells".

As soon as possible, he was admitted to hospital. He put on the pyjamas and the pale blue towelling dressing gown which the hospital supplied, and his wife took away the clothes he had worn when he walked into the ward. Suddenly, he was a patient and his small but flourishing business was non-existent.

His lung was removed and showed a much bigger cancer than was seen on the X-ray. As often happens when this operation is carried out in an industrial town, he became more breathless after the operation. This is because atmospheric pollution had caused damage and disease in the remaining lung, so that it was not able to carry on the work of two lungs efficiently. I saw him two months after his operation to test the efficiency of the remaining lung. It was a day in April and the bleak harshness of the grey roofs and dark streets were lightened by a hint of spring. Outside the window a man was on a ladder mending the gutter round the roof. John looked out at him and said "Ah wonder if 'e knows 'ow lucky 'e is—Ah don't expect 'e does—nobody thinks about 'is puff till its gone". And then he added "Ah'd give everything in the world to climb up me ladder again". He never did climb his ladder again, the cancer had entered his bloodstream and it spread very quickly all over his body. He died from generalized cancer four months after his operation.

The medical evidence, which is now accumulating fast, indicates very strongly that lung cancer is correlated with air pollution and cigarette smoking. In the case which I have just described, not only did these mean suffering and death to a man of 41 years, but they meant that a woman was left a widow with three young children to care for. How will the death of their father affect two little girls of nearly ten? The baby is now two years old, and all his life he has breathed polluted air.

I wonder how much of John's story is to be repeated in his own children—it depends almost entirely on how long we take to clean the air. Babies like his are at a special risk, because from their first breath they are continuously exposed to polluted air.

But not all children are exposed to risks such as these. Most men, who can afford to, look to the peripheries of the industrial towns, study the prevailing winds and buy houses which are clear of the worst of the pollution. They use fast cars to go to their work in the centres of the towns and escape to cleaner air as quickly as possible at the end of the day. Money buys distance. And the risks to their children's lungs is lessened.

Operation Dangers

Two very common operations are repair of hernia in men and gynaecological repair operations in women. Surgical and anaesthetic techniques are now so good that these are not considered dangerous operations—in most places. But in industrial towns, there are additional factors which make all operations dangerous. Firstly many patients suffer from bronchitis as well as the condition for which surgery is needed. This means that they are chronic coughers and this means that when they are recovering from the operation they may cough and the pressure from this coughing will have to be taken by the stitches in the operation wound. These stitches are not only on the surface, but in the tissues inside the skin. If the pressure from coughing is too great or prolonged, the stitches will tear through the skin and the wound will gape open. Secondly, in winter, fogs are likely to descend at any time. If the unfortunate patient wakes up from his operation to a ward filled with irritative soot particles suspended in mist, his cough will be intensified and his life will be in danger.

So great is this danger, that necessary operations are often postponed until the spring, when the possibility of fog is less. Some operations can be postponed, although it may mean submitting the patient to a further six months of pain or discomfort, but others must be done without delay and cannot safely be postponed. The surgeon, therefore, has to choose between the risk of allowing the patient's condition to deteriorate and chancing the weather. If he decides to operate, he takes the risk that in the vital 10 days after the operation, the ward will stay reasonably clear of fog.

These conditions are caused by dirt and they jeopardize the lives of people who live in industrial towns. Is it reasonable or in the least bit justifiable to tolerate them?

The psychological stress which dirt and ugliness impose upon human beings has never been accurately assessed. Indeed, I think it is impossible ever to do this. But it has been shown that men, women and schoolchildren work better in clean and pleasant surroundings. Well designed, light and cheerful looking halls in railways and underground stations have shown that staff work more efficiently and passengers move more quickly and purposefully than among the dirt of the old fashioned ones.

In order to obtain any assessment of the effect of dirty surroundings and falling dirt in the environment, I think it is necessary to look carefully at the industrial towns of this country and to compare them with towns in the South with no industry or, better still, with the towns in Scandinavia.

I think that it is so important for everyone in this country to know the facts about air pollution and the oppressive ugliness of industrial towns, upon which we are all deeply dependent for our existence, that if I had been organizing this Conference, I should have seen to it that every delegate and his wife went on a conducted tour of some of the towns 70 miles west of here. I would have shown you brutal acres of treeless streets, and grim relentless dirt that you can even smell. I would have shown you a small part of the huge black beating heart of industrial England.

"Where tha's muck tha's brass" is a phrase which is usually said with a smile by the older generation and it expresses both genuine gladness and greed.

The gladness is felt by workers who remember the days in the 'twenties and 'thirties when the depression closed factory after factory and the lines of the dole were long and bitter. In those days a smoking chimney meant work and money and a full belly and it takes a long time to forget idleness, cold and hunger. Among these men a real affection for smoke lingers on. Their wives too remember the ache of hunger and the crying of children. Cleaning up the dirt from the factory chimney in those circumstances was infinitely preferable to having no food in the cupboard.

But now, those times are so far away that the majority of people cannot remember them. In 1963, dirt has no beneficial effects to excuse it, but only hardships to condemn it.

It is not difficult to imagine the disillusion and despair of the newly married girl who sees her new curtains filthy in a week, her pretty chair covers smeared with dirt from her visitors clothes and the dust everywhere silently falling all the time. She cleans it up and its there again. She shines the windows and before her husband comes home, they are dull again. Her reaction is either hopeless surrender to squalor or a grim dogged struggle with dirt that never lets up. In millions of homes, there is only one tap and the water is cold. Washing has to be pegged out on a line across the street and the dirt clings to its dampness and makes advertisements for whiteness look absurd. Mothers have told me that they dare not hang nappies out, because the grit that falls on them scratches the baby's skin. The volume of washing is of a magnitude undreamed of by the mother living in the country.

These are some of the repetitive manual jobs of a dirty atmosphere. They are done in an environment of dull black buildings and hard streets of small houses where the smoke from a million chimneys gathers to make an umbrella against the sun.

Surely nobody needs statistical figures to show that this is not good for human beings—it is so evidently bad, that tolerant acceptance of it is baffling.

"Where tha's muck tha's brass"—the smile of greed belongs to those factory owners and shareholders whose vision is restricted to profits and dividends at the expense of the people who make the goods.

Privileges of Industry

Industry has many privileges, it can set fashion and change design in cars, trains and aeroplanes. By its ramifications into chemicals, clothing, bricks, iron and steel it has great influences over everyone of us and dictates what we use, see, wear and buy. Collectively, it possesses hundreds of square miles of this country. But it does not own the air. And it has no right to contaminate the air.

Nor is it the deserved privilege of industry to spoil the landscape with hideous black buildings of 100 years ago, derelict sheds and rotting fences—to allow acres of yard to be covered in black dust and shallow pools of neglected, undrained water—so thick with filth that they lose the characteristics of water and only reflect the gloom from a grey sky of soot.

The public image given by most factories in the industrial North is of neglect and dirt and to the owners and directors of these, I would like to ask the question "Are your homes and gardens like this too—and if not, why not?"

This is the industrial England of today. These are the places where the Conferences are *not* held, which are by-passed by the roads from Scotland to the South and avoided by people who have seen them once. But these are the places where 40 million people are born, live and work, and produce the goods which are essential to our economy. It is here that very many of them cough and get breathless and die in drab streets or dirty air and filtered sunshine. The major part of industry sits on top of coal fields and coal was once dirt cheap—regrettably but inevitably this led to a lack of respect for coal and the miners who wrenched it out of the rocks, and the fatal mistake was made to regard the boiler house as the last place on which to spend money. In many instances, it is still regarded like this—showrooms are modernized, boardrooms are redecorated and new machinery is occasionally installed in the factory. But the old boiler is not replaced and it is allowed to burn inefficiently and to cloud the air with half-burnt and dangerous pollutants.

What is to be done?

Obviously cleaning the air of domestic smoke is of paramount importance and must be pursued with greatest energy. The present muddle and indecision concerning supplies of smokeless fuel in the North are a great frustration to people who are doing their best to adopt smoke control areas. It is to be sincerely hoped that the Government departments concerned will take steps to understand the situation, and resolve the difficulties purposefully instead of allowing events to control them. The Ministers of Housing and Power will no doubt be assisted by pressure from a well-informed public opinion.

But I appeal to industry for a lead and a tonic. Factories have the advantage of being compact units which can be modernized and made efficient much more easily than rows and rows of tiny old houses. Capital outlay for improvements can be set against tax and spread over several years, and anyhow it would result in greater efficiency and economy.

Modern, successful and competitive industry depends upon top grade executives, scientists and technicians. Which of the industrial towns of the North can obtain the services of these people when they can all obtain good jobs in the South, where air pollution has not left so deep a mark? If these towns in the North cannot attract modern scientific brains, their industries will be unable to compete with those at present growing up so fast in Europe. Unemployment, decline and bankruptcy will follow. Industry has a wonderful opportunity to set an example of dynamic action. Instead of waiting until legislation forces them to clean their chimneys, British industrialists could be ahead—setting an example to their towns and cities and fulfilling higher standards of cleanliness than are actually required of them by law.

So often, town councillors and members of health committees say, when discussing the establishment of smokeless zones, "Why should those houses become smokeless when that factory chimney is pouring out the equivalent of 50, 100 or 500 domestic chimneys?".

If every factory chimney in this country was clean for 24 hours of every day, there would still be the problem of domestic chimneys, but there would no longer be this real and understandable complaint against the big black bully next door. Instead, there would be a practical demonstration of progress and consideration for the public.

This also applies to chimneys which are at present outside the jurisdiction of the Clean Air Act—I mean, for example, hospital chimneys. St. James' Hospital, Leeds, is one of the largest hospitals in the country. In winter its wards are full of patients seriously ill and dying of bronchitis. And all the year round its chimney pours out black smoke over the densely populated streets surrounding it. It alone probably contributes as much poison and irritants to the atmosphere as three streets put together. As the law stands at present, it is the responsibility of the Minister of Health. I would like here and now to make a personal appeal to the Minister of Health, to order all hospital chimneys throughout the country to be clean by Christmas, 1964.

The air belongs to everyone, and anyone who fouls it must be made aware of his action and then, surely, his own conscience will impel him to take effective measures to prevent it.

In one year, the industrialists and the Crown properties, could give the Clean Air Act the greatest shot in the arm it has ever had—one that would be an invigoration and a stimulant to the weary people who are trying to implement the Act in scattered little streets all over the country. Instead of flashy showrooms and impressive boardrooms, I suggest prestige chimneys and clean factories, and if the shareholders do not like it—let them come to see where the goods are made—and if, after careful and honest examination of the industrial towns, and the respiratory cripples who live there, they dare to complain about expenditure—let them do so publicly.

We urgently need great expansions of the industries making equipment for efficient power and heating in factories, hospitals and other large buildings throughout the country. We need many more firms to clean dirty buildings and clear dilapidated factory sites, and thirdly, we need an information service. Television, newspapers and journals should be urged to make a concerted action to educate, inform and advise people on all aspects of air pollution and its solution.

About one hundred years ago, diseases such as cholera and typhoid became correlated in doctors' minds with drinking water contaminated with human excreta. Legislation resulted in closed sewers and modern sanitation, and these diseases became less common, and today they are rare in civilized countries. The present-day practice of pouring into the air we breathe any products of combustion is causing disease in a similar way. In the interests of public health, these facts have got to be faced, and quick and effective measures undertaken.

Ladies and Gentlemen, cleaning the air is not a pastime for well-meaning eccentrics nor a *hobby* for anyone. It is the most important and compelling job of our time. It has got to be done and it has got to be done quickly. The slower we are in doing it, the greater is our responsibility to the young people and babies of today. The longer they breathe air containing poisonous and irritant gases and particles, the greater is the likelihood that they will develop incurable lung disease. The longer we delay cleaning our buildings and brightening our towns, especially in the industrial North, the more drudgery and unhappiness will housewives and their families have to tolerate.

Cleaning the air will prevent disease, let in sunshine and increase vigour. Only laziness and complacency and short-sighted views on cost can cause delay. We have more scientific knowledge available to us now than ever before, and we have breath-taking technological achievements to encourage us. If we can catch the beam from Telstar out in space and turn it into a picture in our sitting rooms, we can certainly clean the air.

It needs only determination, energy, and the clearly seen target of clean towns and clean air.

British Coal Utilization Research Association Annual Report, 1962. pp. 67. B.C.U.R.A., Leatherhead, Surrey.

The report opens with a tribute to Dr. D. T. A. Townend, C.B.E., Director General from 1945 until his retirement last September. We should like to take the opportunity of extending our own tribute to Dr. Townend, who gave the first of the Society's Des Voeux Memorial Lectures at its conference at Margate in 1950. He has been succeeded by Mr. Donald Hicks (formerly of the National Coal Board); and Mr. R. L. Brown (formerly Director of the Association's Basic Research Laboratories) has been appointed as his Deputy.

The report shows the considerable extent of the Association's activities, and it is possible to refer only to a few projects of special clean air interest. Work has continued on the development of a smokeless coal-fired household boiler, but although a good reduction in smoke density has been achieved there remains the problem of ensuring automatic operation which could be maintained for several months without the heating surfaces of a boiler become fouled. There have been promising results in the development of a hot water meter for blocks of flats—the absence of which has been one of the snags in the economic development of district heating.

Under contract arrangement with the D.S.I.R. (on behalf of the Ministry of H. & L. G.) the programme of research into the smoke emission from the domestic fire has been continued during the year, and some 40 fuels and coals have been tested for smoke emission over a wide range of burning rates. Collaboration has begun with the Air Pollution Research Unit of the Medical Research Council to provide the Unit with representative sample of smoke and flue gases from domestic appliances for detailed examination by the Unit for toxic substances.

Emphasis has continued on maximum amenity and automation in the operation and design of plant and appliances. During 1962 a programme on coal-fired shell boilers fitted with automatically-controlled combustion equipment and automatically-controlled ash- and coal-handling gear was brought to a reasonable state of development. Both technically and from the point of view of cost of the steam generated, it is considered that this kind of assembly of coal-fired equipment can be recommended for use by industry in many localities and circumstances.

Report on Gas

The Gas Council: Annual Report and Accounts, 1962-63. pp. 161. H.M.S.O., 12s. 6d. net.

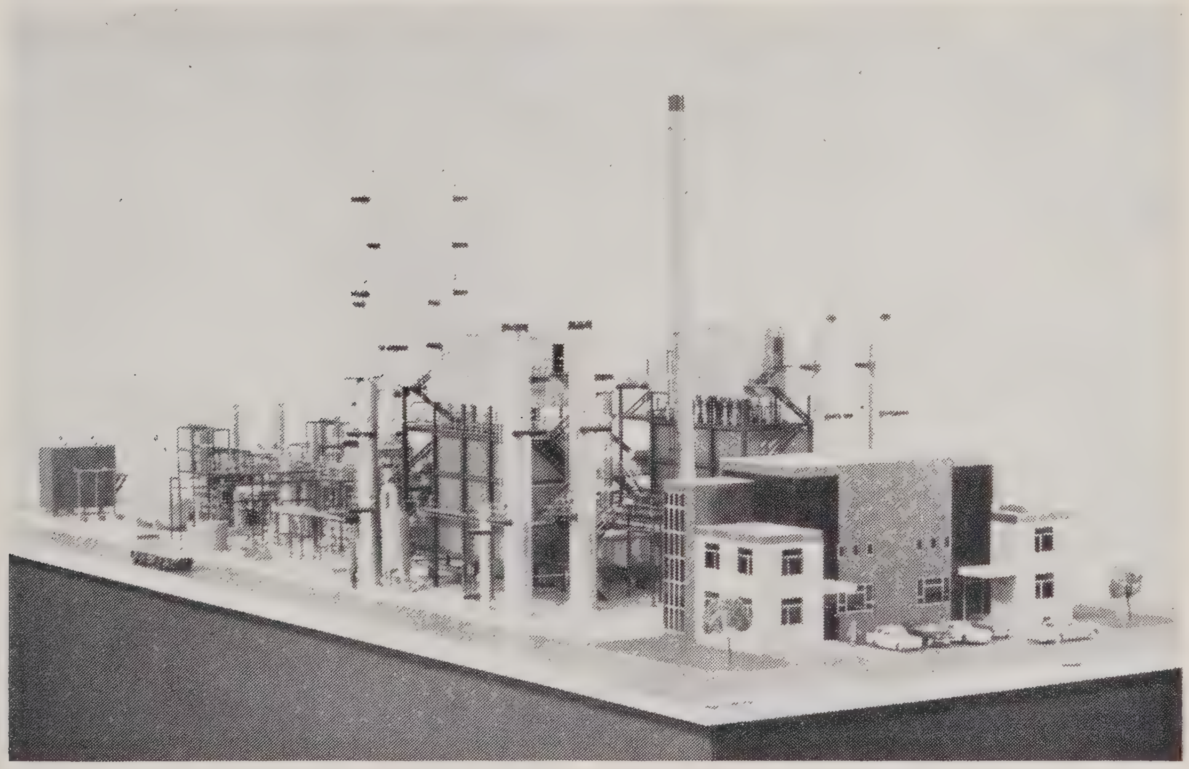
The Gas Council's annual report, for the year ended March 31, 1963, gives the facts and figures behind the industry's leap forward in progress and upward in optimism for the future. Not only do all the Area Boards show a financial surplus for the year—totalling in all £4,875,411—but the increase in the use of gas is well above that which would be accounted for by the extra demand during the winter's severe weather. More important from the particular viewpoint of clean air is the remarkable increase in the sale of appliances for space heating: 63 per cent for room heaters and 49 per cent for central heating. Over half a million of the new space heaters were sold.

On coke for domestic use, the present focal point of concern to the clean air movement, the report says:

"All the evidence points to a steady annual growth in domestic demand for the industry's named fuels, brought about through the spread of smoke control areas from the operation of the Clean Air Act, 1956, and through recognition by consumers of the intrinsic merits of the fuels themselves. Consistent with the overall coke production programme, the industry will take all possible steps to maximize the availability of its named fuels."

The sale of coke and the specially reactive fuels during the year, excluding breeze, was 8·53 million tons, compared with 7·89 during the previous year. The amount of coke exported was 0·64 million tons. The premium fuels, Cleanglow and Phimaix, increased their sales by 32 per cent, to 0·8 million tons.

Commenting on the solid smokeless fuel position at a press conference on the publication of the report, the



Model of plant to be erected at Avonmouth by the South Western Gas Board, comprising the Gas Recycle Hydrogenator and the I.C.I. steam reforming process

Chairman of the Gas Council, Sir Henry Jones, said:

"Coal will continue to be carbonized to the extent that carbonization remains an economic process for gas manufacture. Because the economies of the process are governed largely by the extent to which the revenue from the coke or other solid fuel made meets the cost of coal, carbonization can only continue at works where the plant is modern and the market for solid fuel makes its operation possible. The capital cost of new carbonizing plants is high compared with that of the new oil reforming units, and it seems unlikely that new carbonizing plants will be built for purposes of gas supply. The industry has, however, many modern plants which can stay in production for a good many years if the market for solid smokeless fuel warrants it. But it may be that the great popularity of gas as a fuel for room and house heating will diminish the demand for solid smokeless fuel, and eventually make it uneconomic to keep these plants in operation. We are, in this connection, making careful studies of the needs of smoke control areas for smokeless fuel."

The Industry's New Look

The factors that are making such changes in the gas industry and which are creating concern about the future coke supply problem are discussed in the report, and may be itemized as follows.

There are now two Lurgi plants for the complete gasification of coal. The one at Westfield in Scotland has been in operation for two years, and that at Coleshill has just been commissioned. With representatives of the National Coal Board a joint study is being made of the Lurgi process when applied on a very large scale in advantageous circumstances.

During 1964 oil will arrive from the Sahara. It will be brought to a terminal being constructed at Canvey Island, and pipe lines are being laid to various parts of the country. Later, gas from Holland may be brought to Britain, but discussions with the Dutch authorities are still in the exploratory stage.

New oil and gas reforming plants, some making lean gas enriched with methane, butane, propane or refinery gas, others coupled with the new Gas Council Gas Recycle Hydrogenator, will continue to take up the increase in demand for gas and replace old and obsolete carbonizing plants, of which a number are still in existence.

Natural gas may also be found in the North Sea following the exploratory work in which the Gas Council is associated with Amoco (U.K.) Exploration Company and other firms.

On natural gas Sir Henry Jones said that if it "is found in really large quantities it will, of course, alter the pattern of fuel utilization in a way that cannot yet be worked out in detail. But the future of the gas industry does not depend only on the discovery of new sources of natural gas. The new oil-based processes now available and the sea transportation of liquid gases are capable of providing for all the expansion now taking place."

All Boards are making progress in their plans to de-toxify gas by reducing its carbon monoxide content.

Dealing with research, the report says that the first year of the newly-formed Basic Research Group at the Council's London Research Station has been devoted to establishing the main lines of research to be followed for the next year or two. The basic research initiated at present is in two main fields: reactions at high pressure; and catalysis. These fields were chosen because they are of immediate relevance to the more recently developed processes of gas manufacture.

Research into gas production is largely centred on gasification under pressure by processes for both coal and petroleum feedstocks. These are designed to ensure greater output of gas which is detoxified, pure and of controlled combustion characteristics.

Work on appliance testing continues to expand and 123 new gas appliances and 62 new appliances for use with gas coke were approved during the year.

Reports on Electricity

The Electricity Council: Report and Accounts, 1962-63. pp. 178. H.M.S.O., 13s. 6d. net.

Central Electricity Generating Board: Annual Report and Accounts, 1962-63. pp. 202. H.M.S.O., 13s. 6d. net.

Unlike the report on gas, also reviewed in this issue, electricity requires two annual reports. The C.E.G.B. report is of course concerned only with generation, but as the Board is a part of the Council generation it is also, though more briefly, dealt with in the report of that body.

A few of the main statistics may be quoted:

The sale of electricity rose during the year by 11·4 per cent over that for 1961-62. Just under half went to industry (2·7 per cent more), over one-third to domestic users (21·2 per cent more), and one-seventh to shops and offices, etc. (16·4 per cent more).

Total revenues were £839·1 million, compared with £748·7 million the previous year. Total expenditure (on revenue account) was £796·6 million (£721·8 million in 1961-62), and the balance of revenue, after meeting interest charges, was £2·5 million. This was used wholly to finance capital requirements.

The average unit price of electricity to consumers was 1·566d. per unit, as against 1·550d. in 1961-62.

The total number of consumers rose from the previous year by 1·7 per cent, to 16,363,513.

Average thermal efficiency of generating board stations was 27·44 per cent (from 27·32), and total maximum capacity was 31,687 mw. (a rise of 2,728 mw., or 9·4 per cent).

The Council's report discusses the finances and capital requirements of the industry in the light of the Government White Paper on "The Financial and Economic Obligations of the Nationalized Industries", and the problems of estimating electricity demand and the plans required for meeting it. One of the main difficulties is that it takes five years to bring a new power station into being after it has been decided that it is required, during which time there may be important changes in demand. Thus the domestic demand has increased much more than was anticipated and there has also been a strongly growing demand from commercial users. The consequent difficulties would have been greater if industrial requirements had been correspondingly great. During the past three years industrial usage has been rising by only 4·8 per cent per annum, compared with a growth in domestic sales of 17·4 per cent per annum—a fact which is somewhat disturbing in light of the needs of the nation's economic progress.

A further factor in planning the main transmission programme is that "although it is possible to make adjustments to national estimates for different assumed rates of growth in the economy, a transmission network requires forecasts of regional changes in the economy."

A table gives estimates for the future programme for generation, transmission and distribution for the quinquennium to 1966-67. The total cost of the programme is £2,755·6 millions. It is pointed out that this programme will not be attained unless the expenditure of the necessary resources is approved. But this, continues the report, is not all that is necessary:

> "Probably the most serious obstacle will be the securing of consents for power station sites and transmission lines in time for the capital works to go ahead. The difficulties of securing sites and wayleaves for

[*Western Mail photo*

From the C.E.G.B. Report—dealing with ice-loaded transmissions lines on the Welsh mountains last winter, approachable only by helicopter because of deep snow and drifting on roads

> generation and main transmission by the Generating Board and for the transmission and distribution networks of the Area Boards are undoubtedly growing all the time. While the process of ensuring fair hearings and the weighing of all the conflicting interests that should be taken into account is an essential part of the democratic process, the costs and risks involved for the future supply of power must be made absolutely clear to the public."

The Load Factor

The importance of the system load factor to the economy of the industry is discussed in the Council's report. The phrase means the ratio, expressed as a percentage, of the average load throughout the year to the highest load on the system. The smaller the load factor the greater is the amount of generating plant, and therefore capital, being used only to meet peak demands. It is encouraging that the load factor has risen from 43·5 per cent in 1948-49 and is expected to rise to 50 per cent by 1968-69. The rate of improvement is nevertheless very slow.

The report stresses the importance of improving the system load factor by encouraging "night valley" loads such as floor warming and storage heaters, and says "it is very much in the industry's policy to encourage such loads". This is, of course, also very much to the advantage of the clean air drive, and is to be supported because it is one of the means by which the difficulties on solid smokeless fuel supplies in smoke control areas can be reduced.

The reports naturally refer to the difficulties encountered in the severe weather last winter, when adding to the abnormal demand there were transmission breakdowns caused by short circuits or "flash-overs" due to freezing fog on the insulators. Some dramatic photographs show the appalling weather conditions that had to be grappled with, and the C.E.G.B. and

(*concluded on page 162*)

Chimney Heights

A note on Action by Hayes and Harlington U.D.C.

Section 10 (Height of Chimneys) of the Clean Air Act is intended to give effect to the recommendations contained in paragraph 106 of the report of the Beaver Committee on Air Pollution (1954—Cmd. 9322). The Committee recommended that special attention should be given both by local authorities and developers to the height of new chimneys to secure adequate dispersal of the dust and sulphur oxides in the chimney gases. Sulphur dioxide is discharged wherever coal, coke or oil is burnt whether in industrial or domestic premises but the higher the point of discharge the greater will be the dilution of the gases by the time they reach the ground. It is important to note that section 10 of the 1956 Act is the only provision of the Clean Air Act which is directly concerned with reducing pollution from sulphur.

Control under the section is dependent upon the developer submitting plans under the building byelaws for the erection or extension of a building and thus has its limitations, as has been found in practice. The local authority is directed to reject the plans submitted by developers unless it is satisfied that the height of the chimney as shown on the plans will be sufficient to prevent, so far as is practicable, the smoke, grit, dust or gases from becoming prejudicial to health or a nuisance.

Hayes and Harlington was recently confronted with a case where a developer submitted plans for a new building showing heating by a free standing oil burning furnace with a steel chimney shaft of inadequate height and the plans could not be approved. He then submitted revised plans showing the use of electricity as a mode of heating but when he erected the building he installed his oil heater with a very low steel chimney shaft. There was no action the Council could take to control the matter and efforts at persuasion met with no success. The Council also had another case where plans were submitted and passed under the building byelaws for an extension of a building but the plans did not show any proposals for its heating. A few months later the developer stated that he intended installing a room heater in the extension. The room heater would stand on the floor with a steel chimney shaft which would be fitted by cutting a hole in an asbestos sheet forming part of the roof and no structural alterations were intended. It was not necessary for him to submit plans under the building byelaws and according therely was no control available to the local authority over the height of the chimney shaft. After some persuasion this developer agreed to modify the chimney shaft to provide adequate height to secure the dispersal of the sulphur oxides in the chimney gases.

In another case a gas-fired plant of approximately 4,000,000 Btu. per hour output and served by a very low chimney was replaced by oil-fired equipment. The work did not involve a byelaw submission and the Council had therefore no power to require a higher stack.

Difficulty has also been experienced with new schools, which are exempt from byelaw control. The reluctance of architects to provide chimneys of adequate height, unless they can be incorporated into some other feature of the building, is well known and here again the Council's officers have to depend entirely on persuasion to get a chimney of reasonable height.

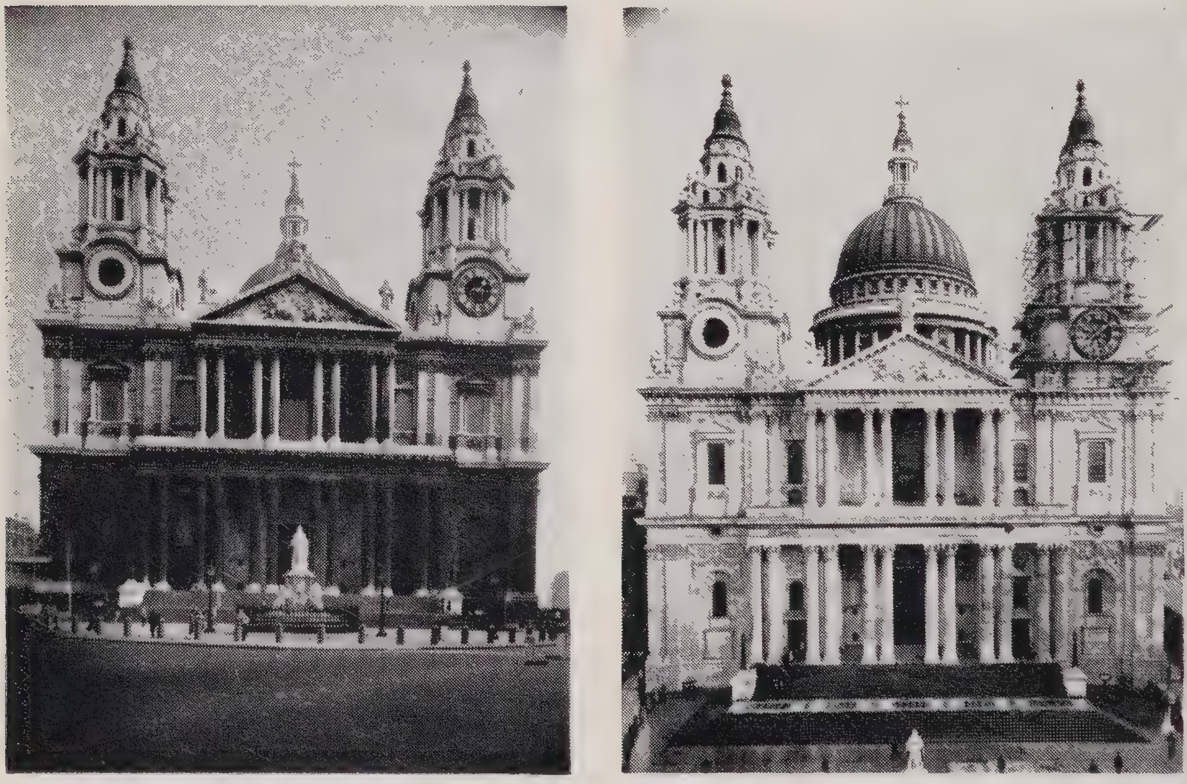
It is suggested that control over the height of chimneys should not be dependent upon whether a building is being erected or extended for which plans must be submitted under the byelaws. It should independently be possible to invoke the control afforded by the section whenever a new furnace is installed or an existing furnace is modified or any modification is carried out to the chimney. The definition of furnace should be drawn so as to bring within control the position whereby the boiler might remain unchanged but the firing equipment might be altered and the situation might give rise to the necessity of modifying the chimney to secure the adequate dispersal of the gases. This would then cover the case of a gas fired furnace served by a low chimney being converted to oil firing without any increase in the chimney height.

The present position is that plans under the building byelaws must either be approved or rejected there being in general no power to impose conditions. Developers' proposals may show that the type of fuel to be burnt is a low sulphur fuel *e.g.* coke or light oil, and subsequently he may, free from control, alter the firing equipment and provide for firing with a higher sulphur fuel *e.g.* heavy oil, which would necessitate an increase in the height of the chimney. It ought to be possible when approving the developers' proposals to a particular height of a chimney to impose conditions relating in particular to the type and quantity of fuel being burnt. Control also ought to be afforded to enable the local authority to ensure that the height of the chimney is maintained and this is particularly necessary where the chimney comprises a steel stack. Steel stacks are particularly prone to corrosion at the top and a case might well arise whereby the corroded part of the stack is removed thereby reducing the height of the chimney.

Section 10 is at present limited to industrial premises and it is thought that it should be widened to bring within its scope the chimneys of offices, shops and large blocks of flats. Such properties are within the scope of section 3 (requirements as to new furnaces) and control over the height of chimneys serving many of such properties could be effected by including in an amended section 10 a provision along the lines of subsection (4) of section 3 relating the control to the Btu. output of the boiler.

Hayes and Harlington decided to try to obtain amending legislation and as a first step enlisted the support of the West Middlesex Clean Air Co-ordinating Committee. Through its individual members the Co-ordinating Committee approached all the appropriate Local Authority Associations and it now seems likely that still one more loophole in the Clean Air Act will be closed.

John S. Hodgins, Hayes and Harlington U.D.C.



The Cleaning of St. Paul's

St. Paul's Cathedral is beginning to look as Wren intended. During the work of cleaning, carried out by the firm of Szerelmy, water jets were used to remove the thick layers of soot and grime, revealing the pale honey-coloured stone. During the work a vast marble frieze, which nobody knew existed, was uncovered.

The cost, for the West Front, was about £10,000, and an appeal has now been made for £150,000 to complete the task. Expensive? *It is what air pollution costs the nation every five hours.*

A Survey of Smoke Control Areas

Report of an Inquiry by the Association of Public Health Inspectors

At the annual conference of the Association at Eastbourne in September last the General Council presented the following report on an inquiry it had made into a number of aspects of the smoke control area situation. The information obtained is of considerable interest and the report is therefore reproduced in full. At the conference it was presented on behalf of the General Council by T. H. Iddison, C.P.H.I. for Dartford and also the Association's representative on the Executive Council of the N.S.C.A. Some additional information, given verbally at the conference, is appended.

I. INTRODUCTION

TAKING into account the changes in heating methods in our homes, which are implicit in the creation of smoke control areas, there has been surprisingly little opposition from householders. The householder, conditioned by the many years of publicity on the evils of dirty air; the housewife, with her realization that the elimination of smoke would bring great compensations to her daily work; the appliance manufacturer, with his development of new appliances; the solid fuel distributor, bowing to the march of progress and the need to sell a variety of fuels; the fuel industry, faced with the rapidly increasing demands for more of all fuels; and the local authority and its officers, calmly facing opposition, patiently explaining, diligently helping and where necessary applying pressure; all this by the end of 1962 resulted in 1½ million premises being covered by smoke control orders.

Detailed information on the progress in creating smoke control areas up to December 31, 1961 is contained in the Ministry of Housing and Local Government's publication Smoke Control (England and Wales) 1962–1966 (Cmnd. 1890). It is not proposed to reproduce this information in the paper.

To obtain detailed information for this paper, questionnaires were sent to the chief public health inspectors of 166 local authorities in black areas having 500 or more dwellings covered by smoke control orders made up to December 31, 1961. This date was selected to relate with the summary in the Ministry of Housing and Local Government's publication.

TABLE 1

Types and Numbers of Local Authorities Returning Questionnaires

County Borough Councils	38
Borough Councils	82
Urban District Councils	36
Rural District Councils	1
Total	157

TABLE 2

Total Area Covered by Smoke Control Orders in Operation at March 31, 1963 in Districts of Local Authorities in Table 1

	Acres
County Borough Councils	84,321
Borough Councils	59,199
Urban and Rural District Councils	25,481
Total ..	169,001

II. APPLIANCES

In the early days of housing improvement grants it was accepted on economic and fuel conservation grounds that financial assistance should be given towards the replacement of inefficient and wasteful old-fashioned grates. Conversion work under the Clean Air Act is all too often regarded as being done solely to avoid contravention of the Act, whereas such work is providing the country with an economic asset in eliminating much wastage of fuel.

The Clean Air Act provisions covering dwelling-houses, were introduced largely on the premise that there would be little interference with traditional open fire heating and that the installation of an open coke burning grate would make little difference to the pattern of the family sitting round the fire. We have now reached the stage where we must consider passing on from this position to one where the open fire, even the approved appliance type, is to be condemned for its inefficiency as a heating unit. It is, moreover, unable to burn effectively the full range of solid smokeless fuels which are available, particularly the harder cokes, of which large quantities are in stock in many parts of the country. The development in design of underfloor draught types of open fire has potentially increased the range of fuels which might be used but has not overcome the need for the exercise of some care if satisfactory operation is to be achieved.

One of the disadvantages of burning non-premium solid smokeless fuel is the greater difficulty of ignition compared with the freely reactive smoky fuels. The development of ignition by gas or electricity has overcome some of the disadvantages but it has not entirely obviated the need to repeat the relighting operation morning by morning in an effort to provide heat for a family at breakfast. There would seem to be particular merit in an appliance such as the openable stove readily capable of continuous burning, even at a very slow rate of fuel consumption, and capable of burning any of the wide range of smokeless fuels. It is suggested that on grounds of efficiency, ease of operation, and ability to accept this wide range of fuel, the present restriction on grant for openable stoves should be reviewed.

TABLE 3

Number of Premises in Smoke Control Areas in Districts of Local Authorities in Table 1

	Domestic	Industrial	Commercial	Other
County Borough Councils	228,419	3,592	29,964	5,821
Borough Councils	416,503	5,109	36,238	4,597
Urban and Rural District Councils	79,148	248	1,371	687
	724,070	8,949	67,573	11,105

Consideration should also be given to the increased use of whole house heating; to limit the conversions to provision of a new appliance with a performance a little better than that of the existing appliance, does little to increase the standard of living conditions. Whilst grants for adaptations must be restricted to the reasonable cost of replacing existing appliances, every encouragement, short of increased grant aid, should be given for the installation of more comprehensive heating arrangements. Loans for this purpose are freely offered from commercial sources but local authorities might bear in mind their ability to lend money for house improvements of this kind.

In considering appliances the advantages of those using gas, electricity or oil must not be overlooked. Flexibility in fuel usage is essential, particularly with the modern trend for husband and wife to be away from home during working hours, and the efficiency of appliances using these fuels points to the contribution that they can make to the national economy. If greater grant aid is to be given for the more efficient openable solid fuel appliance then gas, electricity and oil should also be given more generous consideration than some authorities have felt able to give in the past.

To change over from methods of heating which warm large quantities of room air and discharge it up the chimney, to new methods which having warmed the air retain it in the room, is a most effective economy. It is often forgotten, however, that most domestic ventilation was designed taking into account the frequent air changes involved in the more wasteful forms of heating. Whilst too rapid an air change is wasteful and uncomfortable, comfort conditions require a reasonable amount of air movement and some limited change, particularly if having cured the chimney of smoking, the family continue to smoke! Further research on ventilation requirements and the frequency of air changes is necessary to produce acceptable standards of room comfort.

A great deal of the economy to be found in using modern appliances can be lost if the carefully generated heat is dissipated through walls, windows and roofs. Modern design of living room heating often provides for sufficient spillage of heat into the hall and bedrooms, but this will not make any effective contribution unless thermal insulation can be ensured when new appliances are installed. Loans on heating appliances should always be extended to cover insulation and every other encouragement should be given to reduce heat loss.

III. FUEL

(a) Coal

In the past, because of the tremendous reserves of coal in this island, domestic, commercial and industrial users have been able to obtain any amount they wished to order and without any thought of economy to waste it as they pleased. This age has disappeared but with traditional reluctance we shut our eyes to the fact. Prodigious wastage in past years of our very high grade coal, changes in mining techniques and the need for smokeless fuels in domestic appliances mean that raw coal must gradually disappear as a domestic fuel. Coal merchants must think of themselves as suppliers of solid smokeless fuels, particularly where domestic supplies are concerned.

(b) Coke and Gas

Since the early days of the twentieth century "smoke abatement" pioneers have thought mainly of gas coke as the fuel for domestic use. Indeed a great deal of the early pioneering work was done by gas companies anxious to find a market for their largely unsaleable by-product. Coke production has been associated with gas manufacture for so long that few realise that gas engineers are now planning to produce gas without making coke. The Lurgi process, oil gasification, and now Sahara gas, all point to the revolution taking place in gas manufacture. In the House of Commons, on May 24, 1963, the Minister of Housing and Local Government referred to these changes in the gas industry. These could mean that at varying stages and in different places additional supplies of open fire coke may cease to be available to meet the requirements of further smoke control areas. The Minister said he was instituting an immediate review with the Minister of Power on the possible changes needed in the current arrangements and that the greater use of closed and openable stoves will be among the matters discussed.

The contribution of gas as a fuel is likely to be a major factor in home heating of the future. The production of gas without coke can be justified on the ground that the industry's primary responsibility is to produce cheaper gas and more of it. Any deficiencies in gas coke supplies may be more than compensated by the greater use of gas fires.

(c) Hard Coke

In the industrial areas, where the National Coal Board have coke oven plants, adequate supplies of excellent smokeless fuel are available but they are of hard coke needing the openable type of appliance for use for domestic heating. For more general use the Board have been experimenting with the production of a new type of open fire smokeless fuel. The pilot plant is to be turned over to semi-commercial production this autumn and the briquette fuel will be available in limited quantities in selected areas.

(d) Imported Fuels

People with strong nationalist feelings and those whose sympathies are tied to the coal industry have frequently drawn attention to the dangers of relying on imported fuels, the supply of which might be subject to interruption. Despite this, oil has become popular as a fuel, particularly for central heating plants, and now we see the gas industry importing large quantities of gas. It is clear that as a nation no longer are we to regard ourselves as being in a position to fuel our homes from locally produced supplies.

(e) Electricity

Electricity, mainly a means of turning home produced coal into more versatile means of heating, is looking to other sources for its primary power. Oil is being used, but much interest is being shown in the use of nuclear energy. So far this has not shown economies but a method of directly converting heat into electricity without passing through the steam turbine and conventional generator stage is being investigated at Harwell. Although much research remains to be done such development would improve the planned efficiency and economy of future power stations.

(f) Heating Trends

In the questionnaire which the General Council sent to chief public health inspectors of certain local authorities they were asked whether the survey for their last smoke control area indicated a distinct and increasing trend away from open fires burning solid fuels to any of the following alternatives. The replies are tabulated in Table 4.

TABLE 4

	Yes	No
(1) Openable solid fuel appliances . .	20	113
(2) Gas	62	70
(3) Electricity	56	72
(4) Oil	7	123

If there was a trend predominantly towards one of the above alternative heating methods the chief public health inspectors were asked to name it. The replies to this question were as follows.

Openable Solid Fuel Appliances	Gas	Electricity	Oil
4	56	36	nil

(g) Solid Fuel Distribution

From time to time, and particularly during the bad weather, there has been much publicity on alleged smokeless fuel shortage. These comments have mostly arisen because of the incorrect opinions that exist as to the definition of smokeless fuels. Too frequently are these limited to the premium smokeless fuels whereas the Smoke Control Areas (Authorised Fuels)

Regulations, 1956 contains a considerably wider definition. Distribution was poor. Many fuel merchants do not stock sufficient to see them through even a short period when transport is interrupted. In some instances only a week's supply is held. The foreseeable large scale closure of railway goods yards, the traditional stock yards of so many merchants, will aggravate the problem. The introduction of regional grids with the consequent closure of the smaller gas works will result in complications in smokeless fuel delivery. If solid fuel is to maintain its place in domestic heating a much better service is needed.

The questionnaires issued by the General Council sought information on difficulties (excluding those created by winter weather conditions in 1962-63) in the operation of smoke control orders due to fuel shortages. Of the 157 local authorities who returned questionnaires, 49 reported difficulties due to shortages of premium solid smokeless fuels and only 7 of shortages of non-premium solid smokeless fuels.

During the winter of 1962-63, 98 local authorities became aware of difficulties due to shortages of premium solid smokeless fuels and 45 of shortages of non-premium solid smokeless fuels.

(h) Future Fuel Policy

Within a few years for the various reasons already outlined, local authorities may not be able to depend on the modern open fire burning a solid smokeless fuel as the primary replacement in smoke control areas. We must ask, therefore, whether local authorities should continue to plan for its use on the present scale. Each fuel industry is so convinced that their fuel is the fuel of the future that only a detailed investigation by an impartial body could properly assess the position. The question of "where are we going?" is so material to the nation that the General Council feel that the Government must be pressed to carry out now such an investigation and produce a policy of domestic fuel usage. Our present concept of domestic clean air work may well have to be drastically revised to meet the situation likely to be revealed.

IV. ADMINISTRATION

The questionnaire circulated by the General Council sought information as to the current method of obtaining details for submission of orders to the Minister. The replies are summarized in Table 5.

TABLE 5

Full Detailed Survey	Pilot Survey	Postal Questionnaire	Other
130	29	16	2*

* (*a*) *Estimate of cost and fuel requirements for private houses based on past experience. Detailed survey of Corporation houses.* (*b*) *10 per cent sampling in housing estates.*

Information was also obtained on the number of local authorities employing personnel other than qualified public health inspectors in smoke control work. Ninety-seven authorities employ such staff in making surveys and 74 for supervising works of adaptation.

Replies to the questionnaire also gave the information that 100 local authorities based their costs on which grant is payable on the cheapest possible method of solid fuel conversion, irrespective of the wishes of the owner or occupier.

It was also established that 144 of the local authorities allowed grant for the cost of providing electric igniters. 117 local authorities, however, had adopted in their most recent orders the general exemption allowing the use of sticks and paper referred to in Circular 28/60.

The questionnaire obtained information on the service of notices under Section 12(2) of the Clean Air Act, 1956. The details of those local authorities serving notices are summarized in Table 6.

TABLE 6

(1) Before date of operation of order ..	64
(2) After date of operation of order to regularize late applications for grant ..	108
(3) After date of operation of order as a means of enforcement	74

The questionnaires also indicated that 35 local authorities have done work in default.

It is unfortunate that concurrently with all the conversion work which is proceeding in prospective smoke control areas, many houses outside these areas are being equipped with appliances not on the "approved list" of the Solid Smokeless Fuels Federation and Coal Utilisation Council. Some day the task of converting these appliances will have to be faced. An opportunity exists for this position to be altered with the introduction of Building Regulations which the Minister of Housing and Local Government proposes to make under the Public Health Act, 1961. The Association has expressed the view that in the case of solid fuel appliances only those which appear in the "approved list" should be fitted.

It is said with some truth that administratively it is easier to secure the demolition of an unfit house than to replace an unfit fireplace. Far too much administrative effort is being tied up in this work. The Ministry of Housing and Local Government, eager to make the housing improvement grant scheme more effective, was able to adopt for this work a scheme of standard grants. This scheme does not require that all bathrooms provided are to be the same. It is doubtful whether any part of house improvement has produced greater diversity of thought and pattern than providing a bathroom; square, rectangular, in basements and in attics, and anywhere between, with appliances of all shapes and sizes and colours, and yet with the comparatively large grant from public funds which is at stake we are allowed to average all these differences out and to pay on one standard system. Fireplace conversion is no more complex than producing bathrooms, yet at present each individual case must be assessed separately, although the costs vary in many cases only a few shillings and at the most a few pounds. A standard grant scheme for smoke control area work might mean that some householders lose a little and that some gain extra benefit, but the overall cost to the nation would be no more and the elimination of much detailed survey and grant assessment would remove a great stumbling block to progress. Programmes are in so many cases hindered mainly by staffing problems that the adoption of a standard grant scheme could do much to help.

V. SULPHUR

At central government and local government level it has always been realized that current clean air work is restricted mainly to removing pollution by smoke and grit and is not particularly directed to eliminating pollution by sulphur compounds. Critics who wish to discredit the great contribution which the elimination of smoke and grit can make persist in drawing attention to this sulphur pollution and suggesting that the whole of clean air work should be held up pending the ability to eliminate sulphur.

The position in relation to domestic clean air work is governed by the availability of fuels. Only gas and electricity can give entirely sulphur-free domestic heating and these are not available in sufficient quantities for all to use. There are public misconceptions concerning coke burning. The watchman's brazier with its characteristic sulphur smell is to many typical of coke combustion. In practice a coke grate should only be installed in a house when the flue is capable of efficient removal of products of combustion, and never to replace a coal fire which has a history of smoking into the room. Much more sulphur is actually generated from burning coal but the tarry smoke which is discharged at the same time masks the sulphur to such an extent that the ill-informed do not understand that it is there.

The introduction of smoke control areas could decrease the emission of sulphur oxides by anything up to about 25 per cent, depending on the proportion of coal used in the area for domestic heating. The main change in fuel usage brought about by setting up a smoke control area is the replacement of coal for domestic heating by the various types of coke. For the same standard of comfort every ton of coal will be replaced by 15 to 16 cwt. of coke. Average coke has always been said to contain the same percentage of sulphur as average coal and the same proportion of this sulphur is retained in the ash of both fuels. The change from coal to coke would, therefore, produce the decrease of 20 to 25 per cent in the sulphur oxides emitted. From a recent survey by the National Coal Board it was suggested that the sulphur content of domestic cokes might be lower than was previously supposed and that 1·2 to 1·4 per cent would be a more satisfactory figure to use. This would further reduce the sulphur oxides making a reduction of some 30 per cent in all. (D.S.I.R., Notes on Air Pollution No. 4, April 1963). This decrease may be further accentuated by the many householders who change from open coal fires to gas, electricity or oil.

It must be admitted that on changing appliances in old houses and in building new houses there is a tendency towards installing some system of central heating. This may result in an increase in the fuel consumed so as to heat the whole of the house but where the central heating plant is fuelled by coke this increase in fuel consumption can be accepted, and a fairly large domestic central heating plant operated, without raising the sulphur emission above that of one coal burning fire. Where domestic central heating plants are fuelled by oil, distillate oils of the 34 second Redwood range are usually used, and here the sulphur content weight for weight is about half that of coal, but as the calorific value of oil is much higher than that of coal less oil is used to produce the same amount of heat.

It can confidently be stated that clean air work is reducing the amount of sulphur discharged to atmosphere from dwelling-houses.

VI. CONCLUSION

As a result of the increasing introduction of smoke control areas, greater discrimination is being shown by householders in their choice of domestic fuels and heating appliances. Whereas in the earlier years following the Clean Air Act, the modern open fire burning a solid smokeless fuel became the popular alternative to the coal burning fire, there is now a definite trend in domestic heating towards other fuels.

A population becoming more concerned with domestic heating efficiencies will create a different demand from that which existed several years ago. The problems associated with fuel storage during periods of delivery difficulties and the demand for clean heating have shown an increased demand in many towns for heating by gas and electricity. The need for solid smokeless fuels will, however, continue.

One of the most significant changes now taking place in the fuel industry is the production of gas without the manufacture of coke. This will have a material effect on the production of gas coke which has been one of the basic solid smokeless fuels.

For these reasons there is an immediate need for the suggested Government review of the fuel situation with the formulation of a national policy for future developments. This will, without doubt, affect not only the fuel industry but the policies of the appliance manufacturers.

Considerable experience in administering the Clean Air Act has been gained since the introduction of the first smoke control area. The collation of detail created a heavy administrative burden which was later reduced by the Minister when he abbreviated the information required from local authorities when submitting details of smoke control orders for confirmation. But with so many fireplace conversions being uniform in character, a standard grant system would simplify administration even further. It is also essential to obtain maximum cooperation from the public. This can be assisted, if it is known that specific grants will be made without delay. The scheme briefly described in this paper would achieve a more rapid financial settlement between the authority and the recipient than that which exists today.

SUMMARY

1. Although domestic heating methods change with the creation of smoke control areas, there has been little opposition from householders.
2. The open fire, even the approved appliance, is condemned for its inefficiency as a heating unit.
3. The present restriction on grant for openable stoves should be reviewed in view of the advantages these appliances offer.
4. Encouragement should be given for the provision of whole house heating. Local authorities might consider advancing loans for this type of improvement.
5. Arising from the changing trends in the developments of fuel production and usage, an investigation should be immediately carried out by the Government to produce a domestic fuel policy.
6. Installation of domestic solid fuel appliances outside smoke control areas should be limited to those on the "approved lists".
7. To reduce administration consideration should be given to the development of a standard grant scheme for installation works under smoke control orders.
8. Concern is expressed on the distribution services for domestic solid fuels.
9. Progressive development of smoke control areas reduces the amount of sulphur discharged to the atmosphere.

REGIONAL INFORMATION

In introducing the Report Mr. Iddison gave some additional information of interest. Mr. Iddison said:

"Replies to our questionnaires which have now been analysed on a regional basis indicate a fairly small but steady trend away from solid fuels towards gas and electricity more or less equally in the South-East and North-West, and towards gas predominantly in the Midlands and North-East.

"The weaknesses of the solid fuel distribution system—if indeed it merits the name of system—were fully exposed during the early months of this year. Again an analysis of our questionnaires on a regional basis revealed that under normal weather conditions shortages of premium fuels were experienced at only

13 per cent of the North-Western Authorities, 24 per cent of South-Eastern, 49 per cent North-Eastern, and 50 per cent Midlands. Shortages of non-premium fuels nowhere exceeded 6 per cent. Distribution weaknesses were such that in the last winter 90 per cent of authorities in the South-East reported shortages of premium fuels and 62 per cent of them shortages of non-premium fuels. The differences in other areas were much less marked."

Administration

"Although there would appear to be a reasonable degree of uniformity in administrative procedures some of the differences are such that the amount of financial assistance a resident in a smoke control area can expect is very much dependent on where he happens to live. As has already been stated about two-thirds of the authorities questioned base grant aid upon the most economical method of conversion—regionally this varies from 55 per cent in the South-East to 77 per cent in the North-West.

"The percentage of local authorities including the sticks and paper exemption in recent orders was 66 in the Midlands, 67 in the South-East, 79 in the North-East, and 88 in the North-West. Regional differences in payment of grant for electric igniters were insignificant. Unless most houses are provided with a gas supply the combination of the no-exemption clause, plus payment on electric igniters is one capable of involving an authority in fairly heavy expenditure on ignition alone, and yet it is found in 33 per cent of the South-Eastern Authorities and 32 of the Midlands, compared with only 9 and 14 per cent in the North-West and North-East respectively."

Progress Survey from N.I.F.E.S.

The National Industrial Fuel Efficiency Service publishes not just an annual report and accounts, but with these a Progress Survey. The ninth, for the year ended March 31, 1963, as usual contains much interesting technical information on the work of the organization and, incidentally, on the condition of British industry in respect of fuel efficiency. There is clearly still much to be done. N.I.F.E.S. have carried out investigations in more than 7,000 factories and premises, which is excellent—until we read on and note the comment that "there is undoubtedly scope for greater efficiency in many more of the 30,000 firms and organizations that use substantial quantities of fuel".

N.I.F.E.S. has been sponsored by the nationalized fuel and power industries, the two major oil companies, and the Government of Northern Ireland. In an effort to reduce the financial support required from its sponsors, the Board has been seeking higher fees from its clients, and although this has led to increased income, about 10 per cent less work was carried out during the year under review. This, it is said, appears to be due to the higher fees and to the general slow down in the economy. "There has also been increased competition from the advisory services now offered by the suppliers of fuel—which are provided without a direct charge to the user." Nevertheless at £294,791, earnings were 5 per cent higher than in the previous year.

From April 1, 1964, the annual sum of £450,000 now guaranteed by N.I.F.E.S. sponsors is being reduced to £180,000 a year. As a result of this, and the reduced demand for some categories of service, further cuts in staff will be necessary, mainly by retirement of staff who have reached or passed their normal retiring age.

It is interesting to note that there is an increasing demand for advice on the design and installation of new plant, and that this has more than doubled during the year.

Much of the Survey is in the form of case histories, all of which are technically interesting and revealing, but which on this occasion do not directly refer to smoke emission problems.

GAS MEN AT BRIGHTON

The Gas Council held its eighth "Sales and Service" conference at Brighton at the end of October, and the three day meeting reflected the confidence and vitality of the industry, and also the keen endeavour of its top people to grapple with any outstanding shortcoming in the service it seeks to give to its customers.

The conference opened with an address by the Chairman, Sir Henry Jones, followed by one from Mr. John Peyton, M.P., Parliamentary Secretary to the Ministry of Power. One sentence from Mr. Peyton's address was brief and to the point: "We want coke".

Sir Henry did not mention coke, but in the course of his address he had this to say:

"I wonder whether all of us quite realise that a real break-through in home heating has occurred. Last year we sold 530,000 space heaters and more than 50,000 central heating installations. By March 31, 1964 the effect will almost certainly be that one domestic gas consumer in ten, that is 1,200,000 in all, will have bought a gas space heating appliance or heating installation within the previous two years. Not only does this development present us with new problems of consumer service, it represents an important change in the national pattern of space heating and can have a powerful influence on the Clean Air movement".

The conference, in the Dome, quickly got down to its business—short papers by panels of speakers, followed later by discussions in small groups. It was a real working conference, and one was impressed by the number of first-class speakers the industry possesses. They knew their stuff, and knew how to put it over.

Electricity Reports—

concluded from page 152

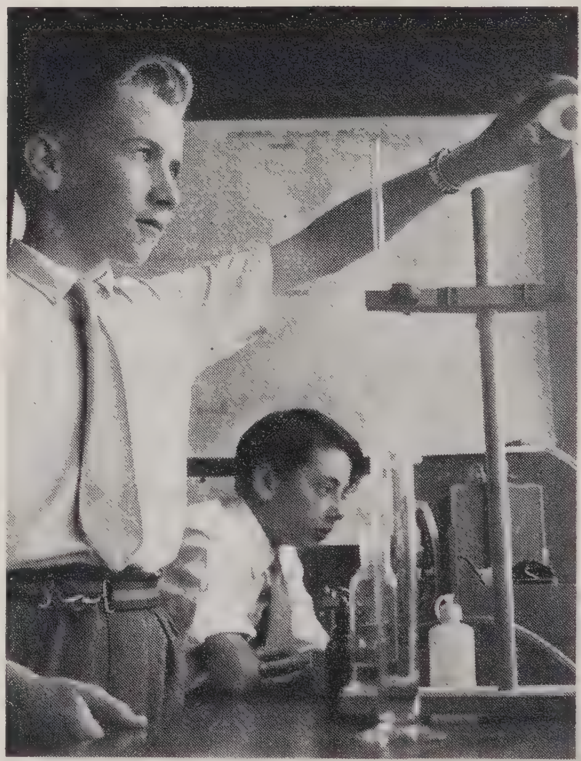
its staff deserve more credit (and gratitude) than they usually receive for what they did to keep the wires alive.

Generation

Sixteen new stations or sections came into operation during the year, with a total of 2,950·5 mw. capacity. Three of these have a capacity of 200 mw. (High Marnham, West Thurrock and Willington B, Derby), while one, at Blyth, had 275 mw. capacity. Larger stations, up to 550 mw. will be coming into operation shortly.

Particle Size Analysis

A regional meeting on this subject, arranged by the Whiting and Industrial Powders Research Council of the D.S.I.R. will be held at Sheffield on October 2, 1963. There will be an exhibition of much of the particle size measuring equipment available in this country.



Pupils from the Hadley Modern School, Salop, conduct their own air pollution observations and are here making analyses in the school laboratory

New Gas Films

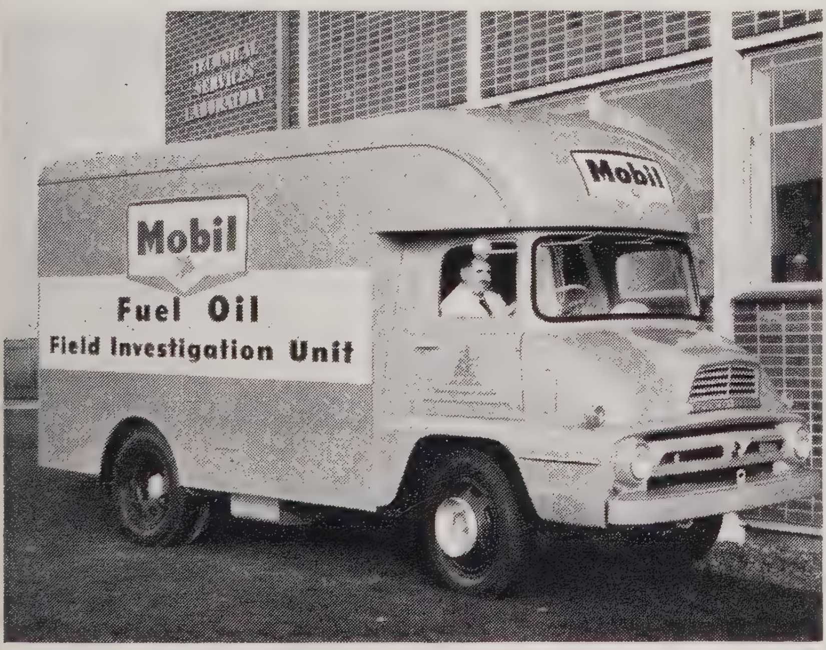
The Gas Council has produced and recently shown three new films, including one of outstanding merit, "Most Precious Gift". This is concerned neither with clean air nor (or barely) with gas. It must however be mentioned because of the interest and value it will have for many of our readers in the field of public health. It deals with the need for personal hygiene, especially in the handling of food, and does so largely through the use of a dramatic and human story. It is very well done, and has been authenticated by a number of official health organizations. Wisely, in our view, it is in monochrome. The running time is 20 minutes. More information may be obtained from the Films Officer, Gas Council, 1 Grosvenor Place, London, S.W.1.

N.C.B. Films

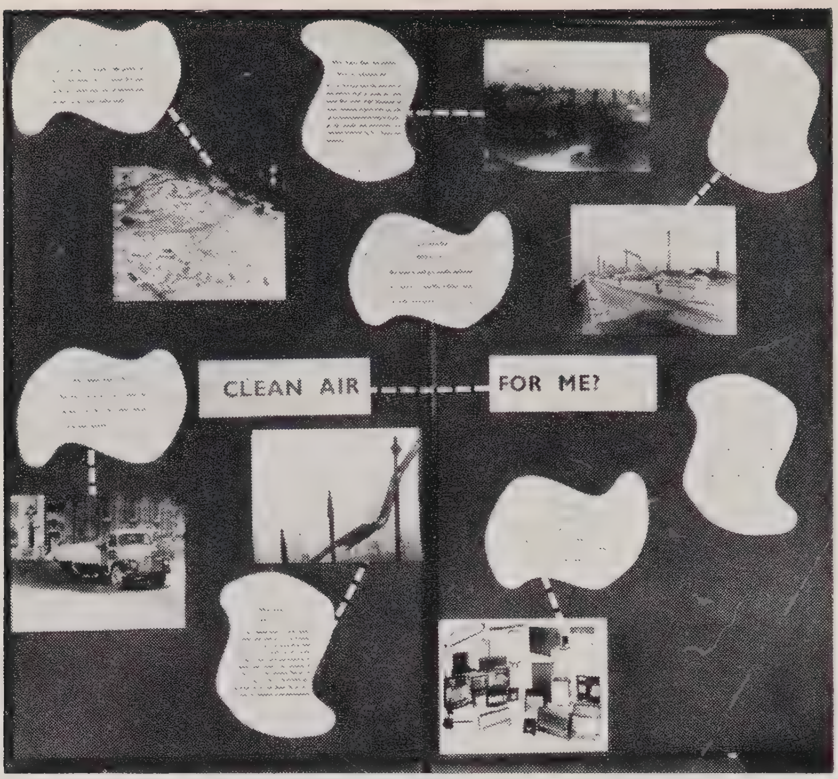
The National Coal Board Film Unit have produced a film that will answer most of the questions that have been asked about the much publicized "Homefire" fuel. Titled "Fluidized Coal Carbonization and Hot Briquetting" it describes the work of the Board's Coal Research Establishment at Stoke Orchard that has led to the development of this new smokeless fuel for open fires and hints of the possibility of large-scale production in the future.

One local authority member of the Society present at the first public showing of the film at the Scarborough 1963 Conference made the comment that viewing the film had taught him more than everything he had heard said about the fuel in the last eight years and it is certainly true that the film is instructive and fully informative from a step-by-step development of the process. However it will make maximum appeal to a technical or specialist audience and if shown at a clean air film show for the general public should be interspersed with subjects of a lighter nature. The film is in black and white and lasts 12 minutes.

A more popular film will be the Board's new production in colour "The Power We Need". In describing the place of coal in the world's energy pattern it makes brief reference to the increasingly important role of smokeless solid fuel as the demand for cleaner air grows. Showing time 15 minutes. Both films are available in either 35 mm. or 16 mm. size and are available on application from The Film Section, National Coal Board, 2 Grosvenor Place, London, S.W.1.



In our last issue an article described a new mobile laboratory for oil combustion investigations in industry. Another such mobile laboratory is operated by another of our members, the Mobil Oil Company Ltd., as illustrated



New Exhibition Unit

Above is one of the two new "do-it-yourself" exhibition kits designed and prepared by the Society. It consists of six photographs and printed descriptive material on cards, and is supplied, in box, with leaflet and suggested layouts. The second kit is quite different and the two may be used together. The kits have the advantage that they can be displayed in any convenient arrangements, according to wall or panel space available, and the various items can be linked together with coloured tapes, etc., as desired. The photographs, each 18 in. by 12 in., are firmly backed and glazed and can be used indefinitely. The kits are not available on loan, but only for sale, the price of each, complete and including carriage being 80s.

Meeting Europe's Energy Requirements. National Coal Board, London.

This is a memorandum by the West European Coal Producers and the N.C.B. and is an important analysis of an important problem. It examines the development of the world energy picture, the development of coal production in Europe, and finally the economic consequences for Europe of excessive dependence on imports. The findings of the memorandum are best given by quoting in full the conclusion:

> "Hard coal is by far the most important indigenous fuel resource of Western Europe. As the administrators and trustees of this resource, we have felt it our duty to set out our own analysis of the situation, basing ourselves on all available evidence.
>
> "This analysis leads to the conclusion that the future availability of European hard coal will become a matter of decisive importance for the safety and health of the European economy, and that the real task of a fuel policy for Western Europe is to enable the indigenous fuel suppliers to meet their future obligations. This is not a matter merely of protecting, to some extent, the market for indigenous coal but of enabling the coal industry to prepare for expansion.
>
> "A contraction of the coal industry today and during the coming years would be virtually irreversible. The issues at stake are therefore very great indeed, extending far beyond the prosperity of the coal industry itself and involving the prosperity and security of the whole Western European economy.
>
> "Having set out these issues as we see them, we submit them to our respective governments, with whom rests the final responsibility for ensuring the security of fuel supplies for the economy of Western Europe".

ADDRESS TO COAL INDUSTRY SOCIETY

Addressing Yorkshire Section of the Coal Industry Society in Barnsley on October 21, Arnold Marsh, O.B.E., Director of the National Society for Clean Air spoke of the hard re-thinking which would have to be done by the clean air movement in view of the important developments in the gas industry which would halt expansion in gas coke production and in time reduce its production. This problem, said Mr. Marsh, could become most serious to clean air progress, were it not for other favourable changes and trends:

(*i*) the abundant availability of high quality hard coke suitable for domestic use in closed appliances;

(*ii*) the development of methods of using off-peak electricity in the home;

(*iii*) the development of new, efficient and popular gas room heaters;

(*iv*) the slow but steady revolution in domestic heating towards standards of comfort, cleanliness and efficiency that call for smokeless methods, even though this factor may be incidental. The growing popularity of central heating is one important aspect of this process of change, even though its effect is still only marginal in the areas where clean air is most urgently needed.

Referring to a recently published report by the Association of Public Health Inspectors on a questionnaire sent to local authorities in the black areas, Mr. Marsh said that the replies indicated—although this could not be regarded as firm evidence—that in the most recent smoke control areas there had been a 30 to 40 per cent changeover from open fires to gas and electricity.

Expressing the hope that the coal industry would ponder over those pointers to the new situation that was developing, Mr. Marsh made the following observations:

"First, whatever its ultimate fate, solid fuel will continue to be required in large quantities in existing and prospective smoke control areas for many years to come. Gas coke (particularly the B.S. "Gloco") will not disappear overnight, but is likely to be available, though not in sufficient quantities for the original Beaver plan, for an indefinite period. The more reactive smokeless fuels will continue to satisfy the needs of those who prefer the open fire and are prepared to pay for it, but the main requirement is for the open fire in new housing and in new smoke control areas to be replaced by openable stoves, gas and electricity (with oil as an alternative choice in central heating).

"Gas and electricity, as the figures quoted show, are already playing an important part in supplying what is needed for clean air progress, and will contribute more. But the most urgent need, bearing in mind the essential part that solid fuel must play, is for the openable stove to achieve a breakthrough in popularity. There are signs that, thanks to excellent new designs, with their cheerful glass fronts, a movement towards this is developing. But much more, in the way of publicity, needs to be done, and it would be a great help if ways could be found for reducing the price of these appliances.

"In this the coal industry has of course a vital interest, and it is hoped that any lingering desire within the industry to cling to the open coal fire, that penny-farthing relic, will be replaced by an understanding that in that direction there is no future. By publicity, technical and educational services, and co-operation with others in the clean air drive, the industry can and should play a most important part. It is not so much competition with the alternative fuels that has to be considered, but rather a need for each of them to make a contribution and to occupy the sector that is open to it, in an effort in which none could hope to succeed alone".

Emigrant

The Society has lost one of its individual members. We recently received a letter, which we quote in full without comment:

"On November 10 next, my wife and I are leaving the country to settle in Australia. I therefore wish to terminate my membership of the Society. We are prompted to make this move by the disgustingly filthy conditions in this country due to air pollution."

CONTRIBUTIONS TO CLEANER AIR

Industrial and Commercial News

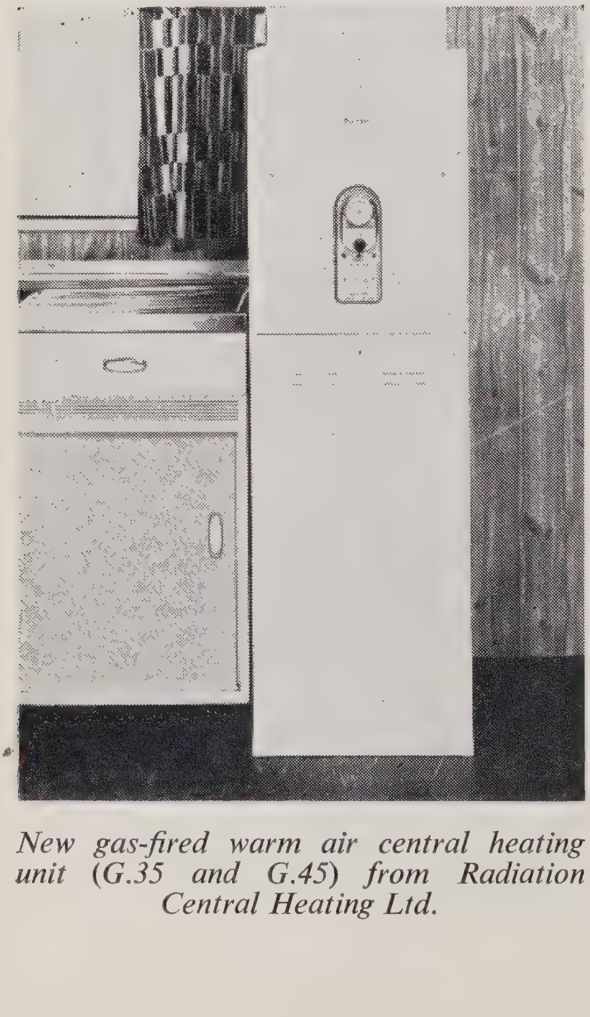
New Aga Domestic Boilers

Following the introduction of the new-style Aga SF (solid fuel) domestic boilers, Allied Ironfounders have announced the Aga OFP range, consisting of four oil-fired pressure-jet models, with outputs from 70,000 to 140,000 Btu. per hour, and the Aga G range—four gas-fired models, from 33,000 to 90,000 Btu. per hour.

The exceptional working efficiency is shown by the performance of the OFP 70, smallest of the range, which will heat a 40 gallon cylinder and up to 345 sq. ft. of radiation surface, including pipes *i.e.*, at least 13 radiators. The new Aga gas-fired boilers will be available either with or without a small-bore unit for connection to small-bore piping. The gas boiler will heat, for example, a 30 gallon hot water cylinder and, according to model, up to 530 sq. ft. of radiation surface.

New Ductair Units

Two new gas-fired warm air central heating units that possess many new features have been produced by Radiation Central Heating Ltd., the firm which introduced domestic warm air heating in Britain sixteen years ago.


New gas-fired warm air central heating unit (G.35 and G.45) from Radiation Central Heating Ltd.

Both models, G.3501 and G.4501 are identical in size and cover a wide range of outputs, from 30,000 to 35,000 Btu. per hour, and 40,000 to 45,000 Btu. per hour respectively, and are designed for two to four bedroom houses. They have many advanced features, including a new type of composite gas control unit which is automatic, compact, and easily removed in one piece for servicing or replacement. There are clock controls, and an air temperature thermostat which works on the principle that if fanned warm air leaving the unit exceeds the safe maximum, because of an insufficient number of registers being opened, the burner automatically cuts out, leaving the fan still running. It switches on again only when the air is sufficiently cooled.

Handling off-peak storage heating loads

To control the load currents met in domestic 'off-peak' storage heating systems, a new single phase thermal relay has been introduced by Associated Electrical Industries Ltd. It is for use in conjunction with time switches and similar devices, and the single pole contact arrangements can handle resistive loads of up to 100 amperes.

Designated Thermal Relay type DTR 100, it employs a new design of snap action switch. Positive switching action, ensuring the minimum contact wear, is achieved by a mechanical arrangement whereby the contacts are at their maximum pressure immediately prior to opening. The absence of magnetic circuitry makes the unit free from hum and full temperature compensation up to 85°C enables operation independent of ambient temperature fluctuations, and normal mains voltage variations.

The relay is operated by an external time switch. When the time switch contacts close, a heater winding in the relay is energized, causing a bi-metallic operating lever to close the contacts. Operating time from the initial energizing of the heater coil can take from half to two and a half minutes, during which time the winding consumes from nine to ten watts. After the contacts have closed the power consumption is reduced to between four and five watts.

The relay is housed in a standard AEI surface mounting insulated meter case complete with carrying handle and measures 4·92 in. wide, 5·5 in. high, and 4·83 in. deep. Total weight is 3 lbs.

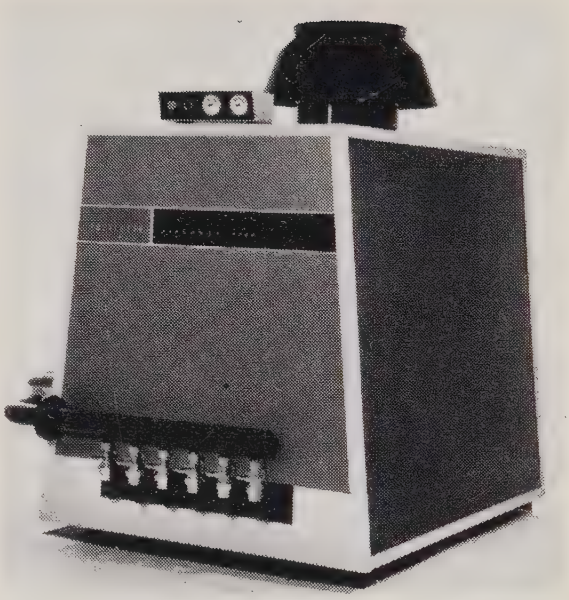
New Potterton gas-fired boiler

A new series of gas-fired boilers revolutionary in appearance and incorporating several research developments is announced by Thomas Potterton Limited. These fully-automatic gas-fired boilers, which are to be known as the Diplomat 'G' series, are designed to meet the heating needs of offices, factories, schools, hospitals and a wide variety of other such buildings. There are six boilers in the series, ranging in output from 900,000 to 2,025,000 Btu/h.

Potterton introduces these as fully-proved heating units for, over the past year, millions of customers in Marks and Spencer's major stores throughout the country have been enjoying the warmth provided by test applications of Diplomat 'G' series boilers.

With the co-operation of this leading store, there are now over a dozen installations in places as far apart as Bath and Perth. Several of these are in roof-top boiler houses. In fact, the installation can be sited anywhere in a building from the basement to the roof and a major feature is that it does not require a resident engineer. This has been made possible by the Electric Ignition and Flame Safety features provided by the Potterton Electronic Ladder Pilot. Thus the highly automatic 'G' series boiler can be lit at the press of a button.

Developments incorporated in the 'G' series, which replaces the three largest boilers in the 'Rex' 3 gas-fired series, are the result of the continual research carried out by Potterton. With the inclusion of heat transfer and sectional design principles developed in other Potterton boilers, the unit takes up little floor space for its output.



A new Potterton Diplomat "G" series gas-fired boiler

A tapered shape resulting from the arrangement of the heat exchange system is reflected in the casing design, which gives a lead in attractive designing of large boilers. The sheet steel casing is in a hammer blue stoved enamel finish with grey edge trims and gives the series the advantage of good looks plus efficiency. Thermostats and control indicator lights are incorporated in a small panel on top of the casing.

Bag Filter order for Holmes

An order for a Holmes-Multiflux Bag Filter installation valued at approximately £100,000 has been placed with W. C. Holmes & Co. Ltd. of Huddersfield by the Ford Motor Company Ltd. The bag filter installation has a total capacity of 136,000 c.f.m. and is to clean exhaust air from casting cleaning machines and grinding wheels in the new fettling department at Dagenham. The contract also includes for the mechanical handling of the collected dust to a disposal and conditioning plant.

A New Flueing System

A new flueing system has been developed by the gas industry specially for industrialized buildings. Known as the "U"-duct system, it was shown for the first time on the Gas Council's stand at the International Building Exhibition.

"U"-ducts are already being installed in Britain's biggest industrialized building project. This is the £2 million, 562-flat L.C.C. housing scheme at Morris Walk, Woolwich, where seven 10-storey blocks and 47 three-storey blocks are being built at the rate of two flats a day.

All the flats will be fitted with gas-fired warm air units and each three storey block will have two gas-heated drying cabinets for communal use.

The "U"-duct system consists of a single duct running from roof to basement and then making a "U"-turn back to the roof. Fresh air is drawn down one limb and feeds the terminals of the room-sealed appliances backing on to the other limb, into which the products of combustion are discharged.

Horizontal ducts under the building are dispensed with and thus there is no need for any costly excavation. "U"-ducts are factory built and no site preparation is required. It is estimated that the system will save well over £50 a flat in the Woolwich scheme.

RECENT TRADE LITERATURE

The Elbair Gas Cleaning System—a new approach to dust and fume collection. Leaflet by Industrial & Metallurgical Equipment Ltd.

Air Sampling Equipment and Filters—Catalogue 220 issued by the Gelman Instrument Company, Ann Arbor, Michigan.

Incandescent Dust Arresters—Coloured brochure No. FP.2a by Incandescent Ltd.

Air Pollution by SO_2—Leaflet describing the Thomas Autometer for measuring and recording sulphur dioxide in the atmosphere. Issued by Leeds & Northrup Company, Philadelphia 44, Pa.

Marchwood Engineering Laboratories—Booklet published by the Central Electricity Generating Board describing the new research laboratories, the facilities available and an outline of the work which will be carried on there.

Sunbrite—the Fuel for Modern Homes—Coloured 12-page brochure, produced by the British Coking Industry Association, designed for the domestic consumer. It contains 36 illustrations of the latest room heaters, both inset and free-standing, domestic boilers, solid fuel cookers and underfloor draught open fires, all of which are suitable for use in Smoke Control Areas.

The Institute of Physics and the Physics Society (which are amalgamated) announces that its 1964 exhibition of scientific instruments and apparatus will be held in the halls of the Royal Horticultural Society, Vincent Square, S.W.1, from January 6 to 9. The 1965 exhibition will be held in April at the Manchester College of Science and Technology.

Completely self-contained with its own built-in time clock and circulating pump, this new Redfyre Autogas 45 Small Bore Unit provides hot water plus central heating for the average 3–4 bedroom home. Push button electric ignition lights the pilot flame when the boiler runs automatically under the control of the thermostat. The running conditions for the boiler are set by only two switches with the operating instructions printed around them. With an output of 45,000 B.T.U's/hr., this new Redfyre Autogas 45 will support a 30 gallon cylinder plus 180 sq. ft. of radiator surfaces including the surface pipes. The first gas-fired boiler to be introduced by Redfyre Ltd. of Sheffield, it will retail for £104 complete

Coal Sales in Smoke Control Areas

A warning to dealers who supply coal in smokeless zones was given at the Rochdale Borough Magistrates Court on May 29 when the Chairman (Mr. W. Turner) said that where a householder was prosecuted it was questionable whether the supplier should not be prosecuted too.

For emitting smoke from the chimney of 10 Wykeham Grove, Bernard Taylor was fined £5 and ordered to pay three guineas advocates fee.—*Rochdale Observer*.

Fume Arrestment in the Iron and Steel Industry was the subject of a two-day conference of the Iron and Steel Institute in London on November 26th and 27th. Fourteen papers were presented and will be specially reported in our next issue.

AIR POLLUTION ABSTRACTS

Abstracts of Papers Presented at N.S.C.A. Annual Conference, Scarborough, 1963

692. Presidential Address. Parker, A. (Proc. N.S.C.A. Conf. Scarborough, 1963). The importance to health of uncontaminated air is emphasized and a historical outline is given of various attempts at prevention of air pollution prior to the passing of the Clean Air Act. The provisions of the Act are summarized and a review is made of the progress achieved in the last seven years. It is estimated that for the country as a whole the quantity of smoke emitted into the air by industry is now less than one-half of the amount emitted in 1956. The domestic grates emit about three times as much smoke as is discharged from all the other uses of coal, and the domestic chimney is the greatest cause of pollution at ground level —yet the progress in dealing with domestic smoke is disappointingly slow, and at the beginning of April 1963, less than one-tenth of the area that should eventually be covered, had smoke control in operation. The solid smokeless fuel situation is discussed and the use of the openable stoves recommended in place of open fires. Although no practicable method has yet been developed for reducing sulphur pollution, a reduction in the amount of smoke in the air should make the winter fogs in urban districts less toxic. A more intensive drive is required to reduce smoke pollution in this country, especially on the part of many local authorities who are apathetic and do not make full use of the powers the Clean Air Act confers on them; the public also must be made to realize the benefits of clean air.

693. Smoke Control Areas and their Problems. Bellingham, E. (Proc. N.S.C.A. Conf. Scarborough, 1963). The similarities between the campaign for clean water, led by Sir Edwin Chadwick in the last century, and that for clean air, are shown and tribute is paid to the services of elected local government representatives. The implementation of the Clean Air Act, and the smoke control area situation are examined. The value of regional administration is discussed, and reference is made to the example of Sheffield and district. Aspects of the solid smokeless fuel situation are considered and it is urged that conversion grants on openable stoves (fires behind glass), together with the new efficient gas convectors should be made available generally. It is also suggested that the improved grant scheme could be integrated with the implementation of clean air programmes.

694. The Importance of Public Relations. Lovell Burgess, M.A. (Proc. N.S.C.A. Conf. Scarborough, 1963). New approaches to the public on clean air are suggested, with attention being given to personal motivation. Encouraging trends in domestic heating and their value to clean air, are noted and attitudes to coke are examined. Against a realistic background the subject of clean air can be seen to be a part of the needs for the completion of the modern way of living.

695. Air Pollution—The Human Problem. Catterall, M. (Proc. N.S.C.A. Conf. Scarborough, 1963). The effects of air pollution on the urban population are reviewed, and a description of the respiratory system is followed by consideration of the influence of air pollution on bronchitis and cancer of the lung. The last section of the paper deals with the psychological effects of air pollution.

696. Pollution from Road Vehicles. Report from the Society's Technical Committee. (Proc. N.S.C.A. Conf. Scarborough, 1963). Report of the work of the Technical Committee of the National Society for Clean Air on the problem of road vehicle pollution, the study of which has resulted in the Society making certain proposals to abate diesel smoke. These are that the fuel feed control on diesel engines should be set and sealed below the smoke formation point and that it should not be altered except by an authorized person. All diesel-engined vehicles should be required to undergo an annual inspection regarding their liability to produce smoke, including the setting and sealing of the fuel stop. The Ministry of Transport should extend its check system on a national and permanent basis and its staff of trained vehicle examiners should be enlarged to make this possible.

697. Progress in a Heavy Chemical Industry. Britten, A. N. (Proc. N.S.C.A. Conf. Scarborough, 1963). The paper discusses the nature of the air pollution problems faced by a large chemical industry, particularly following the Clean Air Act. It outlines the steps that have been taken to solve these problems and describes problems still remaining and their possible solutions.

698. The Warwickshire Clean Air Council: An Exercise in Co-operation. Allen, B. D., Calvert, J. G. and Crow, R. K. (Proc. N.S.C.A. Conf. Scarborough, 1963). The constitution, history and activities of the Council, an advisory body of local authorities, are described. Activities relating to the administration of the industrial and the smoke control area provisions of the Clean Air Act are discussed, and an account is given of research initiated or supported by the Council.

699. An Experimental Chimney for the Study of Dispersion of Gaseous Pollutants. Reed, L. E., Barrett, C. F. and Wallin, S. C. (Proc. N.S.C.A. Conf. Scarborough, 1963). An experimental chimney has been constructed at Warren Spring Laboratory for use in the study of dispersion of chimney gas. Experiments to correlate wind-tunnel tests on a model with full-scale tests are being conducted but no conclusions have yet been reached. A simple method of calculating the concentration produced by the plume from a chimney impinging on a nearby building is given and some calculated results are compared with observed concentrations.

700. Developments in the Coal Industry related to Clean Air. Taylor, A. A. (Proc. N.S.C.A. Conf. Scarborough, 1963). A number of activities of the National Coal Board that are concerned with the promotion of a clean air policy are described. These include the development of open fire smokeless fuels (the first of which will be on the market this year), co-operation with other bodies on coke specifications and on the assessment of smoke emission, support of university research on fuels and combustion processes, the substitution of smokeless fuel for miners' concessionary coal, and collaboration with appliance manufacturers in the development of new and improved domestic and industrial applications of solid fuel.

701. The Gas Council's Search for Natural Gas and Underground Gas Storage. Johnson, C. (Proc. N.S.C.A. Conf. Scarborough, 1963). The value of natural gas to the gas industry, and of the underground storage of gas, especially for meeting the winter peak demands, are discussed. The search for natural gas in this country, and for suitable geological formations for its storage are described. Six gas reservoirs on the lines envisaged would be equivalent to 10,000 large gasholders. Legislation will be required before gas can be stored underground, and the practical aspects of storage are considered. The surface works required with underground storage would be unobtrusive and create little problem on account of landscaping and amenity.

702. Power Stations and Clean Air. Stone, G. N. (Proc. N.S.C.A. Conf. Scarborough, 1963). This paper discusses the chimney emission problems presented by power stations and the techniques developed for dealing with them. A substantial programme of major improvements has been put in hand at small, older power stations where closure has not been possible. At medium-sized power stations, there has been continual search for better operating and maintenance procedures. Large modern power stations with coal consumption of up to 20,000 tons a day are planned. The objectives of current design are to achieve complete and smokeless combustion of fuel, to clean the gases as far as is practicable of solid particles and to discharge the remaining products of combustion at high velocity and temperature through a minimum number of very tall chimneys. Dust deposit gauges and lead dioxide candles are maintained by C.E.G.B. around large numbers of power station sites. An analysis of 16 "before and after" surveys of dust and SO_2 is discussed. These measurements confirm that power stations as a rule do not materially increase the pollution level in their neighbourhood. Research has included a study of chimney plume behaviour including the rise of a plume due to its velocity of emission and thermal buoyancy and subsequent diffusion. Instruments developed to assist in research have included continuous SO_2 meters, directional deposit gauges, flue dust monitors, balloon tracking techniques, photo-microscopic techniques for identifying dust and new methods of size grading of dust. Reference is made to research into dry sorption processes for removing SO_2 from flue gases. Currently, one of the most important tasks for research is determining the largest size of plant, that can rely upon tall stacks and thermal buoyancy for adequate dispersal.

703. Application and Performance of Electrical Off-Peak Space Heating in Buildings. Griffith, M. V. (Proc. N.S.C.A. Conf. Scarborough, 1963). As electricity used directly for heating is convenient, but expensive and sometimes in short supply, off-peak storage heating is an attractive alternative as it can be offered more cheaply during certain hours when power is not required for other purposes. The paper describes with practical detail problems encountered in the experimental work undertaken by the Electrical Research Association to improve the application of electrical off-peak heating to buildings.

704. Grit and Dust Emission: Technical Aspects and Means for Control. Clegg, L. and Short, W. (Proc. N.S.C.A. Conf. Scarborough, 1963). The paper describes the various types of grit arresters, their collecting efficiencies, and their costs. It discusses acid dew points and corrosion problems and the question of chimney height in relation to the dispersion of grit, dust and fumes.

705. Grit and Dust Emission. Administrative Problems of Control. Sugden, F. G. (Proc. N.S.C.A. Conf. Scarborough, 1963). The paper considers the administrative problems which can arise in the control of grit and dust emission. The author begins by examining the legal background, and discusses some of the problems which have arisen in practice in the interpretation of the law, and he makes suggestions in certain cases as to how the law might be amended. In order to make the paper of more general application the author has sought information from the Chief Public Health Inspectors of a number of Local Authorities where problems of grit and dust emissions exist, and the paper discusses in more detail a number of practical administrative problems which seem to have arisen. Amongst these are the relationships between Local Authorities and their officers and the Alkali Inspectorate; the problem of what is reasonably practicable for cold blast cupolas; problems concerned with iron and steel works, electricity generating stations and cement works. Consideration is also given to the methods to be used in determining the sources of emission, and some information is given about apparent trends in pollution.

General Abstracts

706. Atmospheric Pollution Around a Packet Power Plant. Spedding, P. L. (J. Inst. Fuel, October, 1963, 408-413). The intensity of deposited, suspended, and gaseous pollution was determined in the vicinity of a 25 mw. power station fired by spreader stokers. The rural setting of the station on the outskirts of a small town (population 32,000) enabled an excellent correlation to be obtained between meteorological conditions and deposited pollution; excepting where special factors such as the effect of wind re-entrainment or railway pollution were determined. Suspended pollution though being of low intensity exhibited a definite correlation to station loading. Pollution intensities were compared with those from other parts of New South Wales and from other countries. The effect of differing procedures used for pollution determination was estimated. Pollution abatement methods which were used with spreader stokers are mentioned, particularly with reference to coal sizing, grit refiring, and furnace turbulence.

707. Measurements of dust deposit with reference to certain meteorological factors. Barth, H. (In German) (Staub, October 1963, **23,** 452-454). An apparatus is described which is suitable for measurement of dust depending on direction of the wind, and which makes it possible without great expense to determine on the dust gauge the effect of a factory, tract of land or residential area. The apparatus was used to measure the dust deposits in Heidelberg and to determine the differences in dust immissions not only due to wind directions but also to other meteorological factors such as relative air humidity, precipitation and cloudiness.

The Council and their Architect...

. . . Were walking close at hand;
They wept like anything to see
Such tracts of council land:
'If only we could build some homes
To do our council grand.

'If seven homes on seven plots
Were built in half a year,
Do you suppose,' the Council said,
'We'd make our tenants cheer?'
'I doubt it,' said the Architect,
'Unless a Parkray's there.'

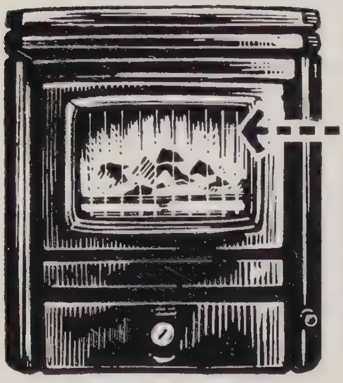
'The time has come,' the Council said,
'To talk of many things:
Of homes with warmth and central heat
(In fact what Parkray brings)
And where the water's boiling hot
Where heating has no strings.'

'An open fire,' the Council said,
'Is what we chiefly need;
Rads, towel rail, hot water too
Are very good indeed.
And as the Parkray's all enclosed,
Control is guaranteed!'

'The 77's what we want.'
The Architect did beseech.
'The cosy fire burns smokeless fuel,
The cost's within our reach.
Heats rads as well in other rooms,
It really is a peach.'

'If we could build with careful thought,
Homes that have all you've said,
Do you suppose,' the council mused,
'We'd end up in the red?'
'I doubt it,' said the architect,
With Parkray in his head.

Parkray



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It looks and feels like an open fire yet it has the greater efficiency of a totally enclosed appliance. It will effectively heat a room of up to 1800 cu. ft, plus 50 sq. ft. of radiating surface, plus all the hot water. Without hot water up to 80 sq. ft. of radiating surface.

PARKRAY 66
This smaller boiler version of the Parkray 77 heats all the hot water and a towel rail—*or* two radiators.

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708. Air Pollution in the city of Warsaw by heavier dust particles. Zwolinski, J. *et. al.* (in Polish) (Annals of State Institute of Hygiene, 1963, **14,** No. 4, 317-322). The paper describes one year's studies (April, 1959-March 31, 1960) which were done in different parts of Warsaw (43 points) on the amount and composition of dust deposits. The results were divided in two parts: winter time, October to March—period of increased heating, and summer time, April to September. Average amounts of dust pollutants were found to be for winter 0·026 kg/sq.m/month (312 t/sq.km/year) and for summer 0·033 kg/sq.m/month (396 t/sq.km/year). These results indicate that air pollution is affected less by increased coal combustion than by other factors such as amount of rainfall, humidity and condition of street and soil surfaces. During winter the deposits contained more organic and tar substances which come from burning of fuel. It is recommended that such investigations should be conducted over longer periods and that aerosols should also be studied as these behave in quite a different way from heavy particles, can be carried over large distances, and are more harmful to health.

709. Acid Droplets in Town Air. Waller, R. E. (Int. J. Air Wat. Poll., 1963, **7,** 773-778). Slides impregnated with indicators have been used in a cascade impactor to detect the presence of acid droplets in urban air. Some acid has been found at all times in London and the acid droplets are most numerous during fog. Much of the acid is contained in droplets of less than 1 μ diameter, but larger ones do occur and acid "rain" has been observed in some atmospheric conditions.

710. An Electron Microscope Study of Particles in Town Air. Waller, R. E. *et al.* (Int. J. Air Wat. Poll. 1963, **7,** 779-786). The electron microscope has been used in a further study of the nature of suspended particulate matter collected from the air of London and Sheffield. In addition to the particles of carbon, tar and ash which had been reported earlier, droplets containing dissolved salts and sulphuric acid have now been recognized as common constituents of urban air.

711. Catalytic Gas-Phase Oxidation and Removal of Sulphur Oxides from Flue Gases. Glenn, R. A. and Zawadzki, E. A. (National Power Conference, Cincinnati, Ohio, September 22-25, 1963, publ. Bituminous Coal Research, Inc.). The paper reports the progress achieved in the experimental investigation of a process for the removal of sulphur dioxide from flue gases. The process is based upon catalytic gas-phase oxidation of the sulphur dioxide and the subsequent removal of the sulphuric acid thus produced. Hot flue gas, previously cleaned of particulate matter, is passed over a catalyst of special design and then processed to recover sulphuric acid as a saleable produce, allowing a greater recovery of sensible heat in the exit gas. No additional raw materials are required; no acidic wastes, solid or liquid, are produced requiring disposal; and increased thermal efficiency of the plant may be realized.

"A boiler with dirty heating surface produces smoke more readily than one with clean surfaces, and a heavily smoking chimney is a public spectacle which needs no advertisement. It creates bad public relations and may even cause commercial harm to the firm concerned".—*Sydney D. Scorer, in "The Steam Engineer".*

PAUL DONG, M.J.I.

official photographer for the National Clean Air Exhibition, 1963

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Oil looks at Air Pollution

The Summer issue of the *Esso Magazine* contains a thoughtful examination of the problem of air pollution in the United Kingdom.

Appropriately titled "Clearing the Air" it poses the question "why should we be content to breathe in dirty air?" It goes on to describe the so-called affluent society as an effluent society and accepts that there must be a certain level of air pollution as one of the prices we have to pay for living in large communities, demanding the products of industrial plant and depending on the internal combustion engine.

A warning is sounded, regarding the mass of statistics dealing with air pollution—it is one thing to collate them and another to correlate them; in doing the latter we find different conclusions emerging as two people examine the same aggregation of figures. Our dependence on the medical profession to establish clear clinical evidence of what constituents of our polluted atmosphere cause illness is emphasized.

Sources of air pollution are examined and the author points an accusing finger at the main offender—incomplete combustion of fuels and the open domestic coal fire is appropriately branded. As is to be expected the comparative consumption of fuels is given (191 million tons of solid fuel against 41 million tons of liquid in 1962) and a higher calorific value for oil is claimed.

The perennial question of sulphur dioxide is given a thorough examination, and the estimated loss of £310 million (including loss of fuel) as a result of air pollution is described as conservative.

The efforts being made to combat air pollution in Esso Laboratories in many parts of the world merits the given sub-title of "Remedial Measures" and it is gratifying to read under this heading of the research being undertaken in connection with road vehicle pollution—"the more objectionable combustion products from petrol engine exhaust".

The question is posed: what price are individuals—and the nation as a whole—prepared to pay to meet the high cost of preventing pollution? The answer is understandably, "it depends on what benefits accrue from such heavy expenditure" and it is at this point that the author emphasizes the magnitude of the task confronting all those who seek to clear the air; the research, the study, the work of public education, the striving for enlightenment in high places and the need to fully convert all in industry to the "good neighbour", policy.

The article concludes by stressing the small measure of guilt of oil in the overall level of pollution. "Nevertheless", says the author, "more can and doubtless will be done. The oil industry is aware of its responsibilities but the power and the duty to reduce these effects rest largely with the consumer and with the manufacturer of the equipment employed".

Diesel Fumes from Locomotives

British Railways have developed a new system for the extraction of diesel fumes and smell from locomotives standing in stations. Hooded ducts over the tracks trap the high-velocity discharges from the exhaust outlets in the roof of the locomotive and extraction is effected by vertical jet 38 in. fans. The fans are switched on by Minerva detectors, which are principally used in automatic fire detection, and which come into operation within 20 seconds of an engine passing under a trough. The first station to have an installation of this type is Cannon Street, London.

Tribute from Tribune

"Of all the do-good bodies active for us, I am greatly impressed by the National Society for Clean Air. Its propagandist and educational activities seem to me essential in an environment which we pollute without any understanding of the harm we do to ourselves."—*Maurice James in "Science in Society"*, *Tribune.*

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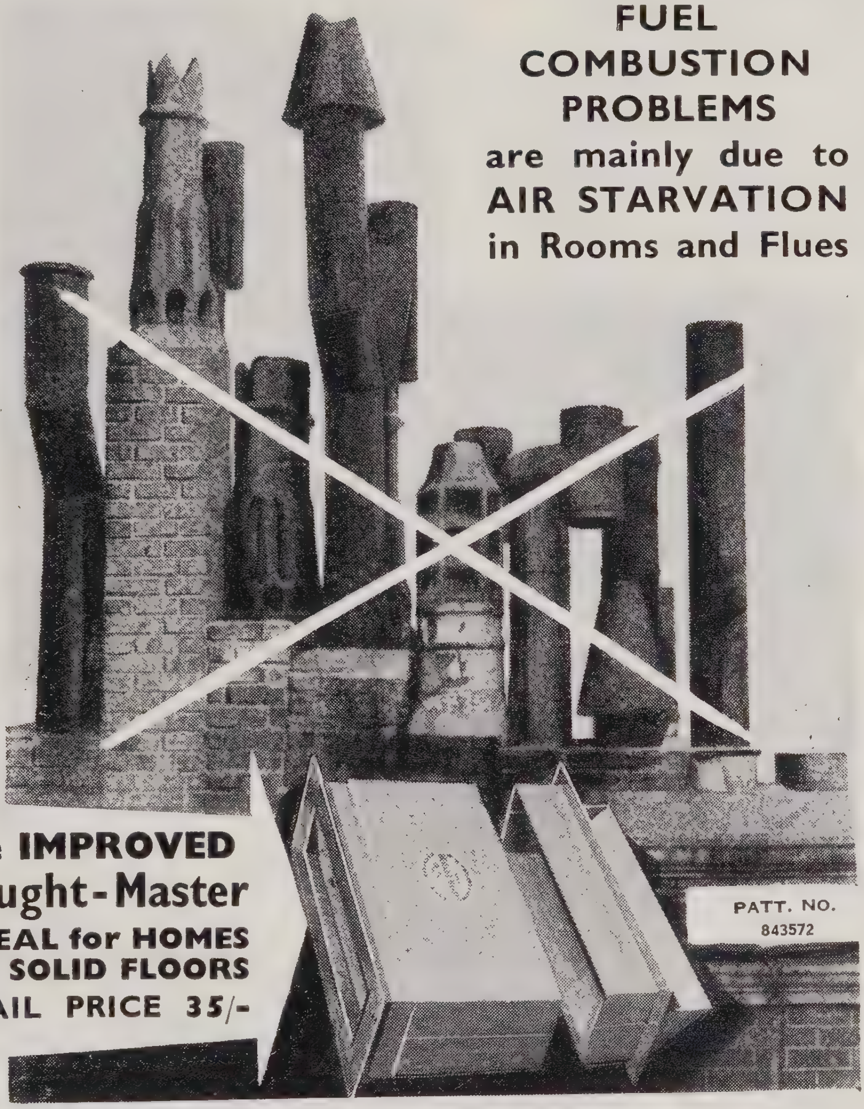

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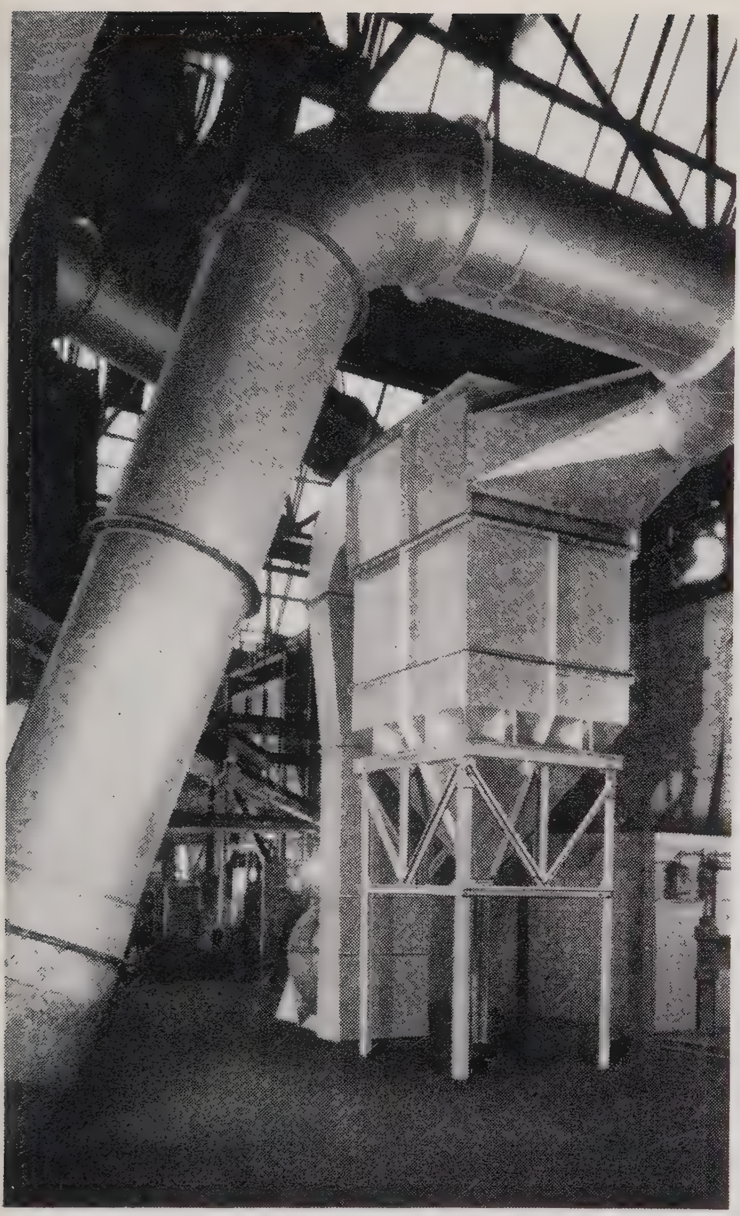

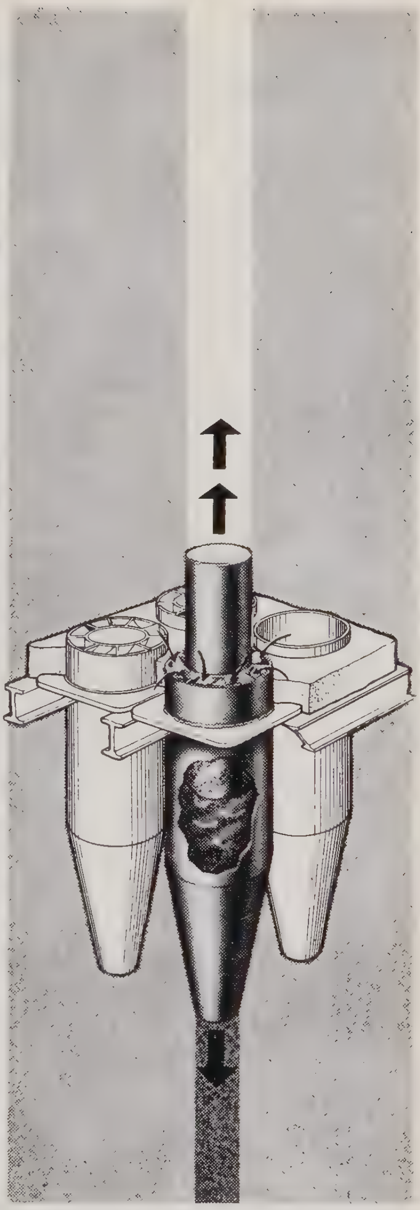

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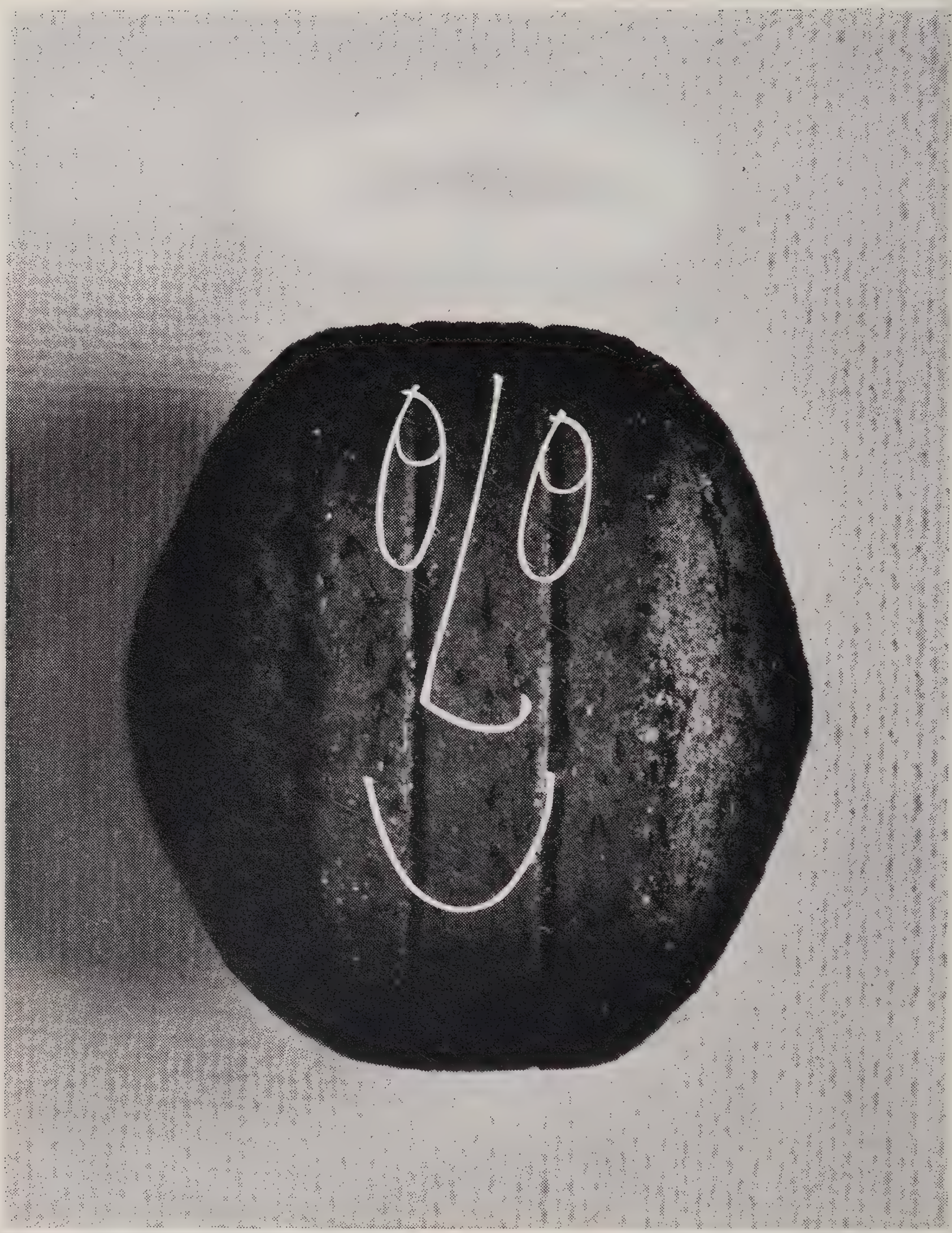

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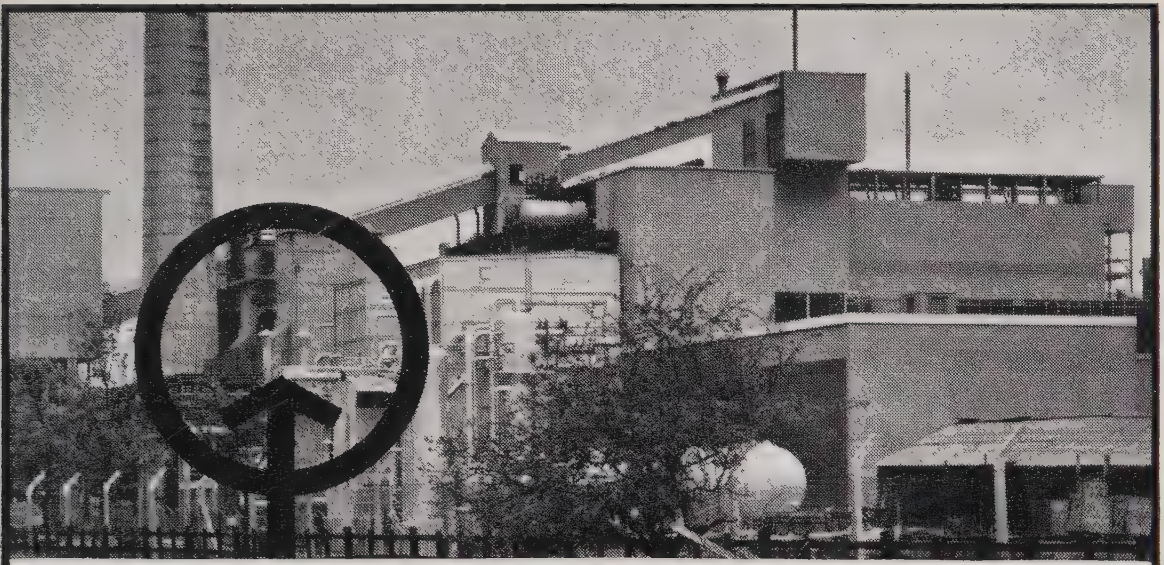
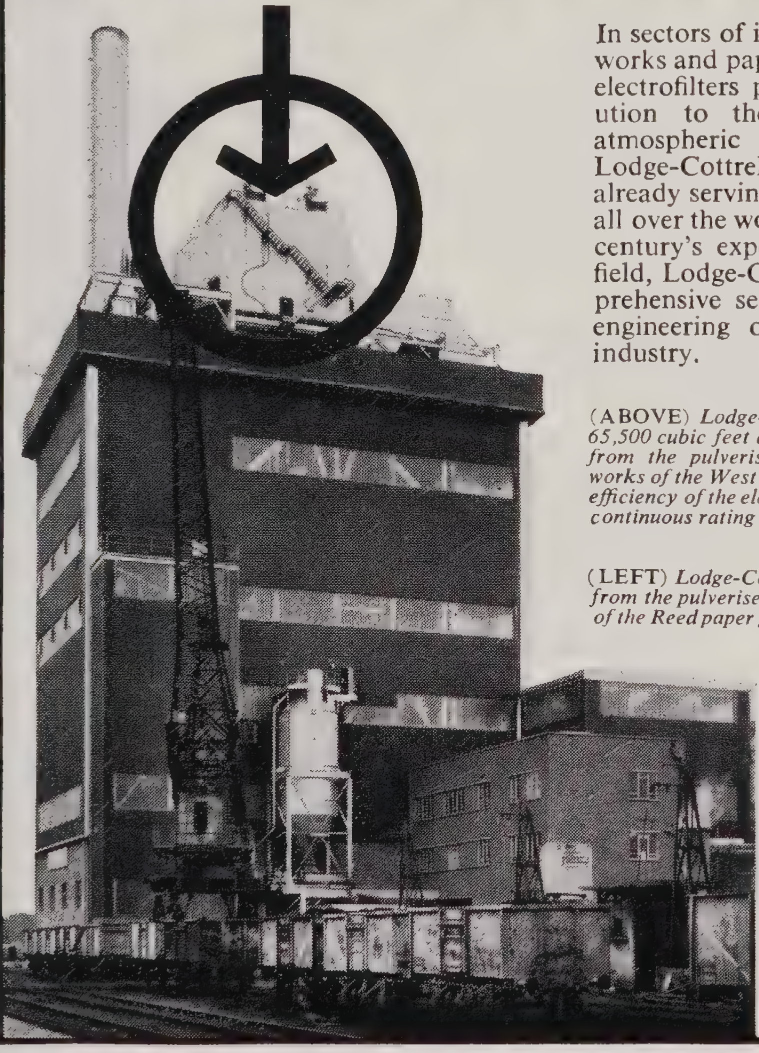


COMMON PROBLEM, COMMON SOLUTION



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(LEFT) *Lodge-Cottrell electrofilters clean gases from the pulverised fuel boiler at the Aylesford mill of the Reed paper group. Gas volume: 118,000 cubic feet a minute at 129°C. Guaranteed efficiency of electrofilters: 96%, proved efficiency on official test: 96·76%. Stack emission 0·136 grain a cubic foot at N.T.P.*

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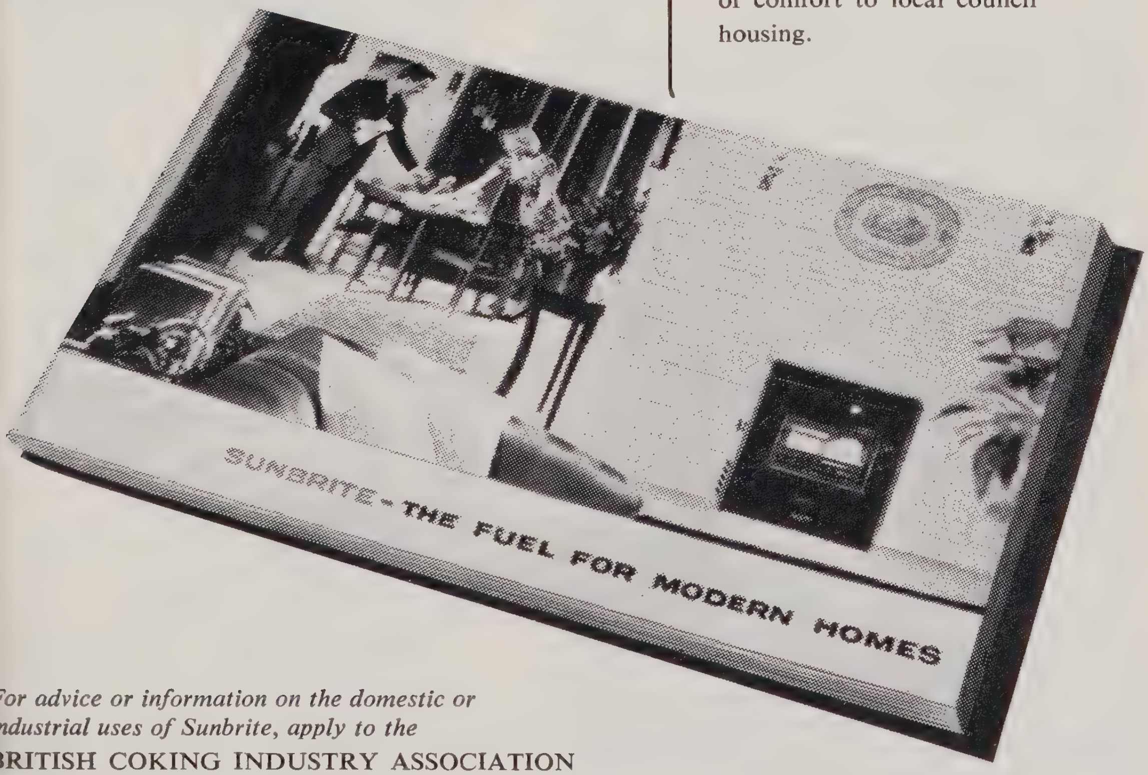

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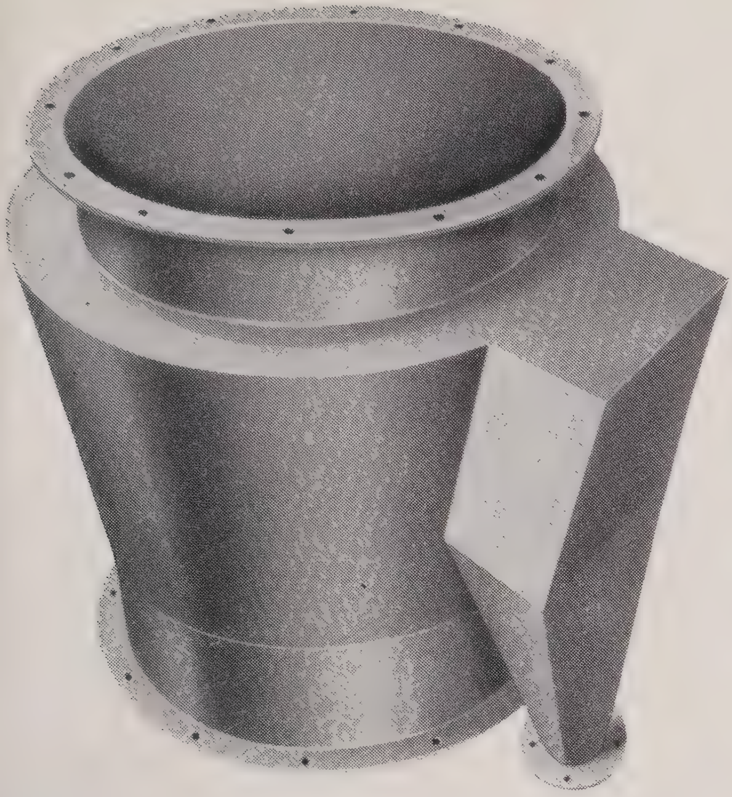

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The "Sirocco" Chimney Grit Collector is produced in six sizes, ranging from 15″ to 30″ diameter. Two types are available: High Efficiency (H.E.) for chimneys where mechanical draught is employed, and Low Resistance (L.R.) for natural draught installations. In the removal of grit (particles over 76 microns) the H.E. Collector has an efficiency of 92% and the L.R. type an efficiency of 87%. The Collectors will also remove a high proportion of the finer dust, giving overall efficiencies of up to 81% (H.E.) and up to 72% L.R. on solids for a coarse stoker fired dust.

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No. 129 ⋆ SPRING 1964 ⋆ 2s. 6d.

In this Issue

If and If and If ★ Clean Air Policy Now ★ Clean Air Bill for Northern Ireland
Air Pollution in South America ★ Fume Arrestment in Steelmaking
Solid Fuel Room-heaters ★ Industrial Pollution Report

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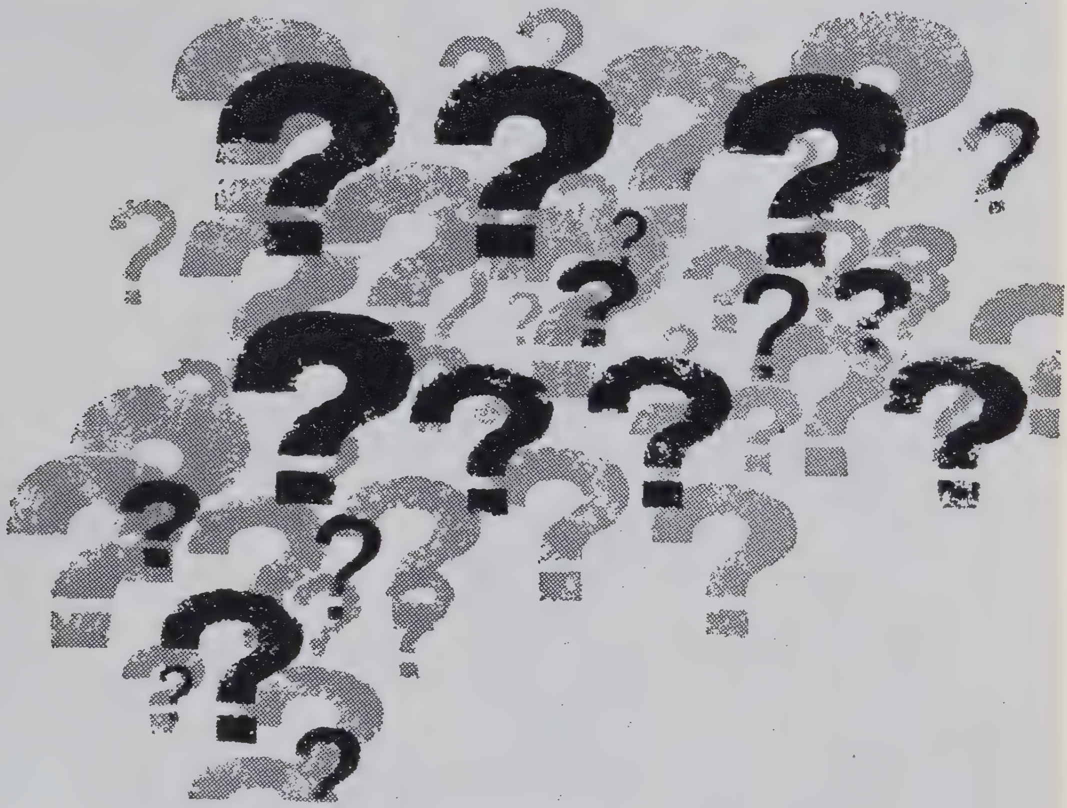

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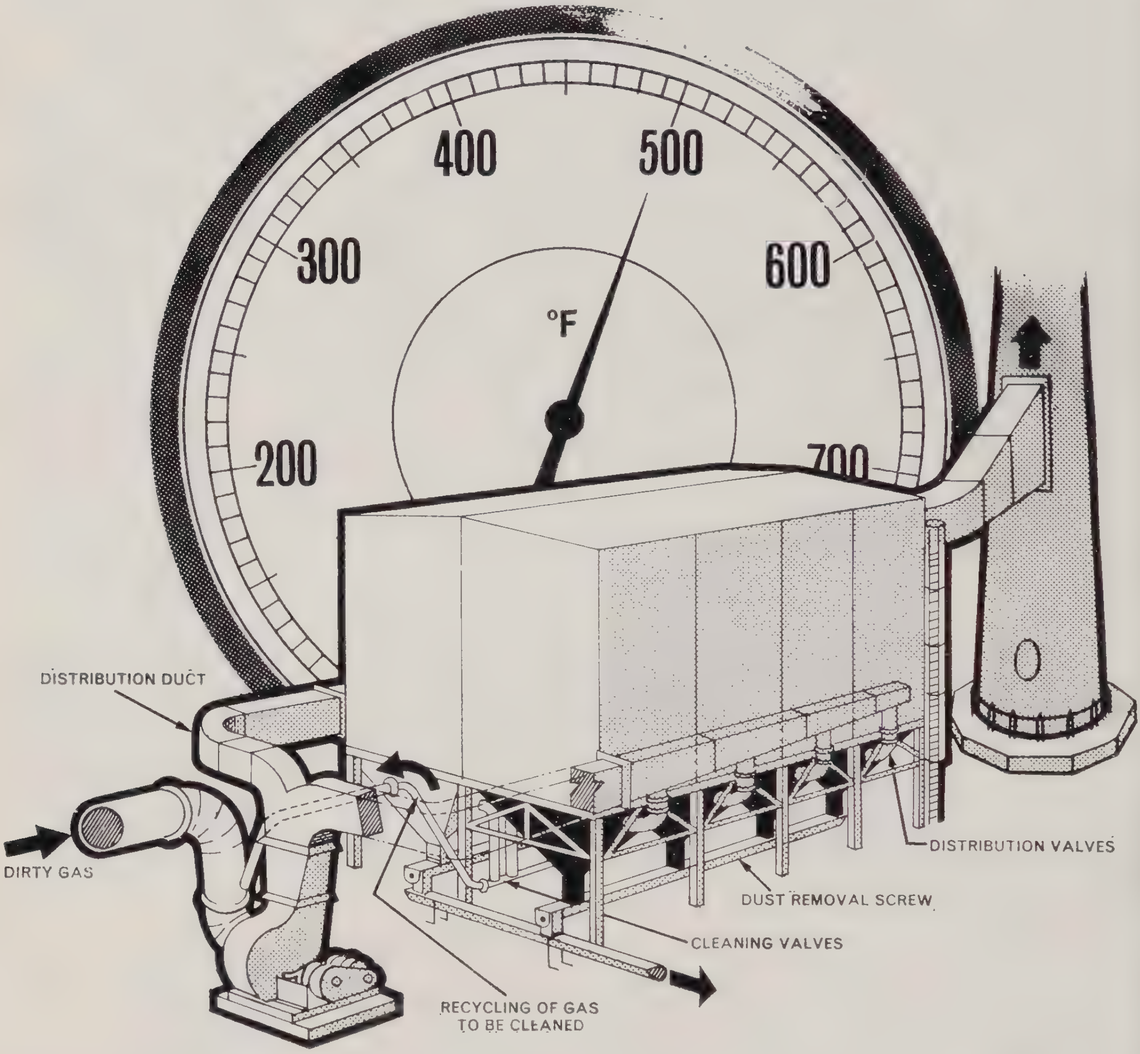

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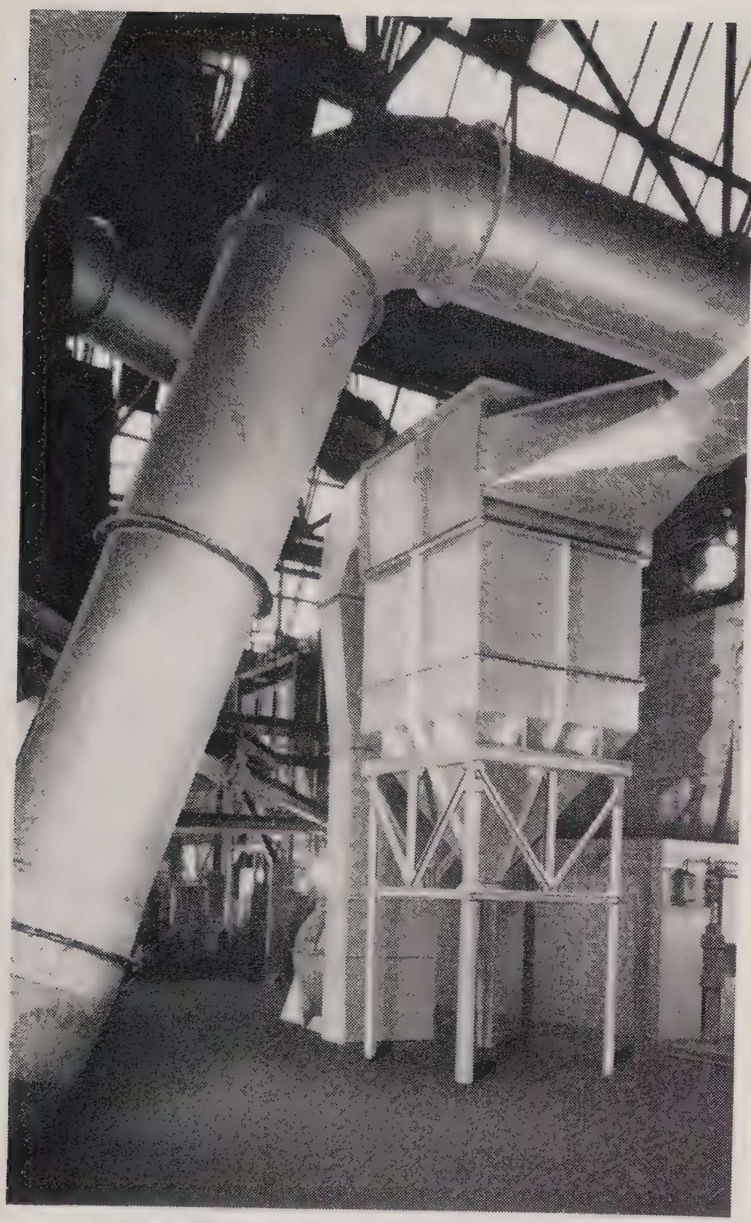

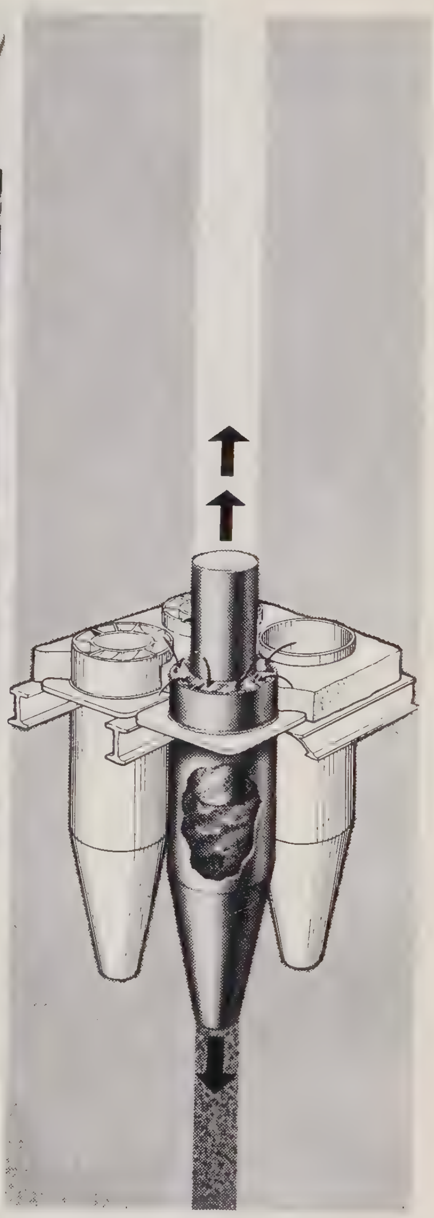

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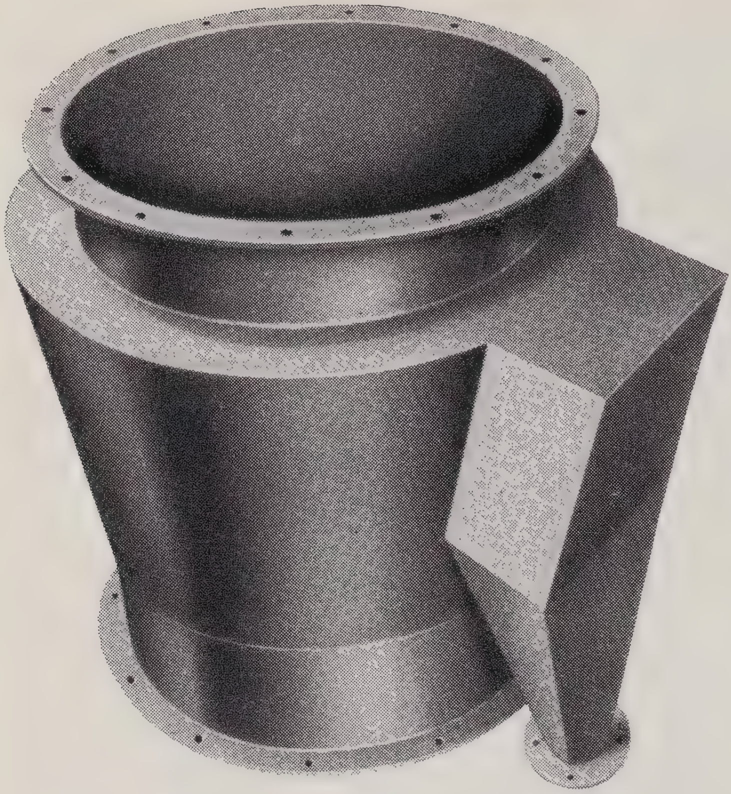

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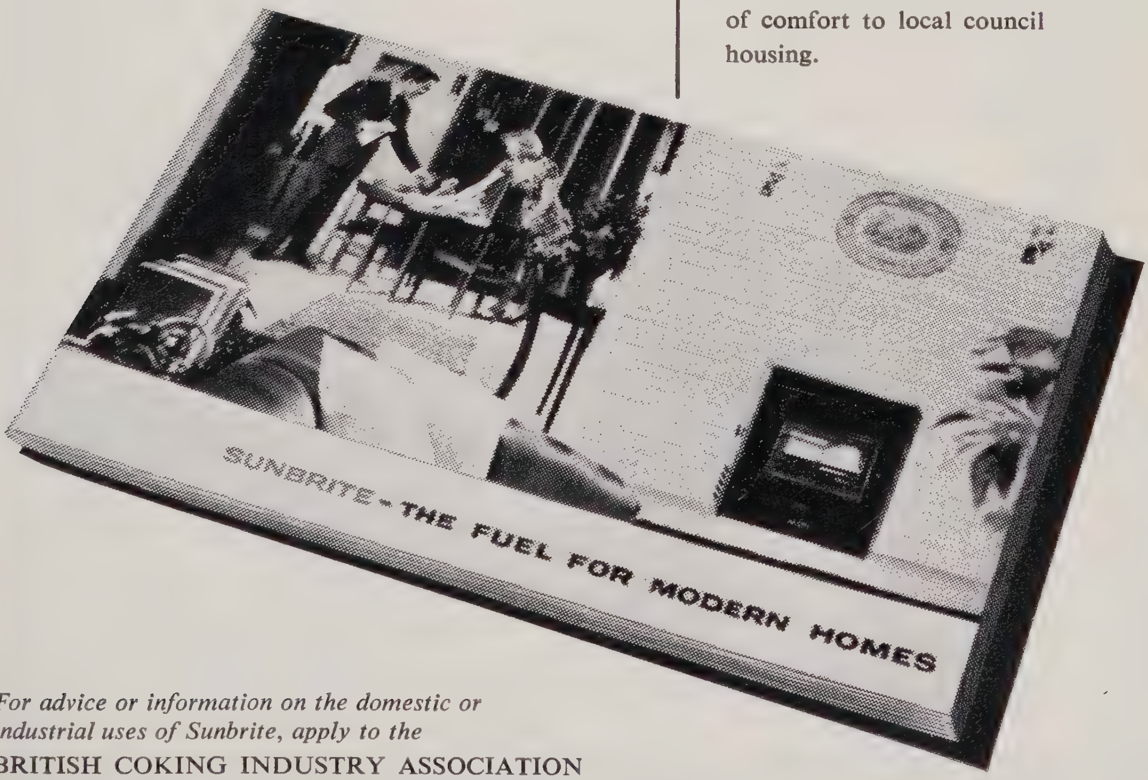

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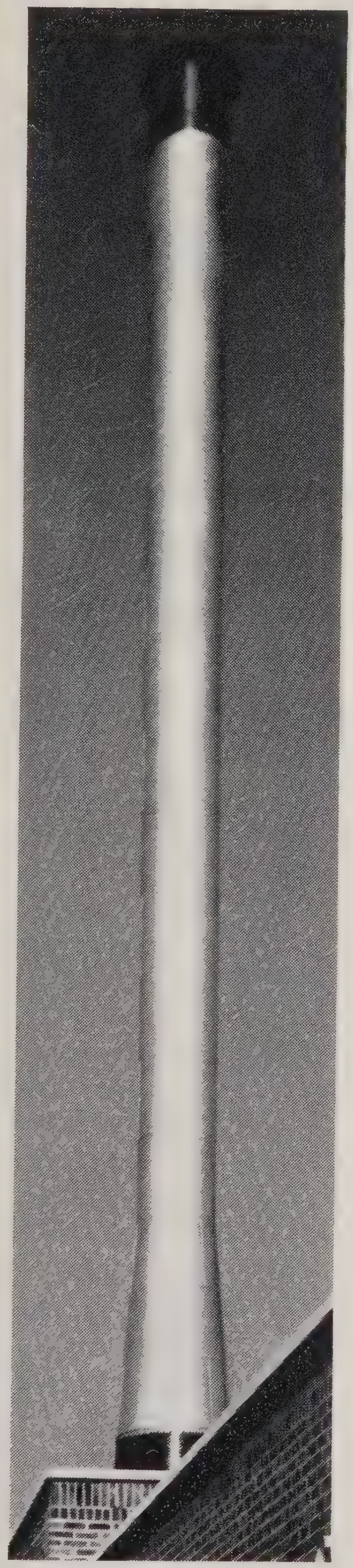

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Following the Annual General Meeting of the Society (members and representatives only), there will be an open meeting at the Connaught Rooms, Great Queen Street, London, W.C.2, at 12 noon on Tuesday, April 14, 1964, when the MINISTER OF HOUSING AND LOCAL GOVERNMENT, the Rt. Hon. SIR KEITH JOSEPH, Bt., will speak on the revised Smoke Control Area arrangements.

The Minister will be the principal guest at a Luncheon to follow (12.30 for 1 p.m.), for which a limited number of tickets are available from the Society at 25s. each.

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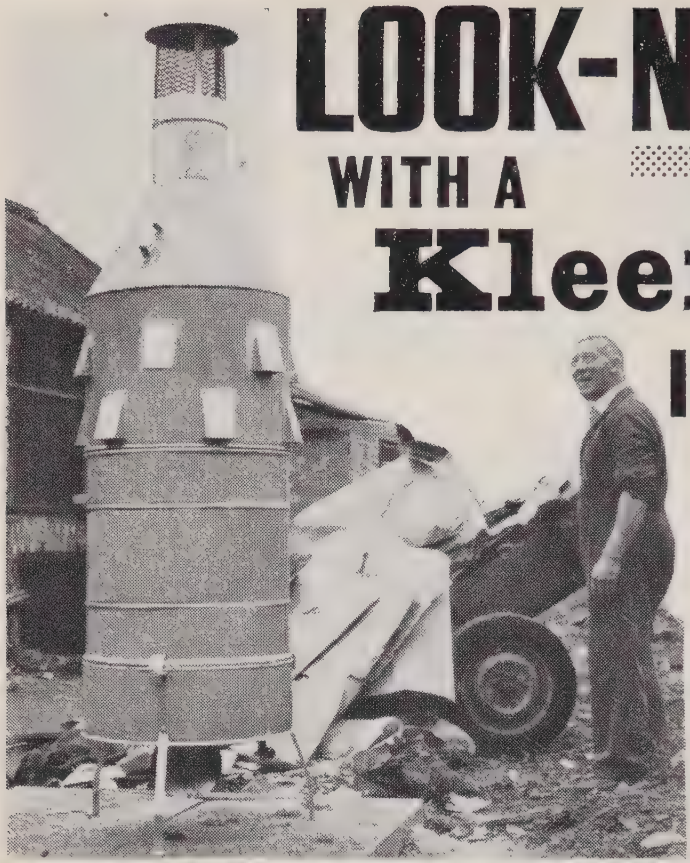

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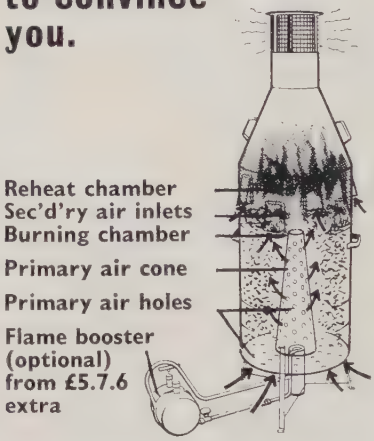

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SMOKELESS AIR

Vol. XXXIV No. 129 Spring 1964

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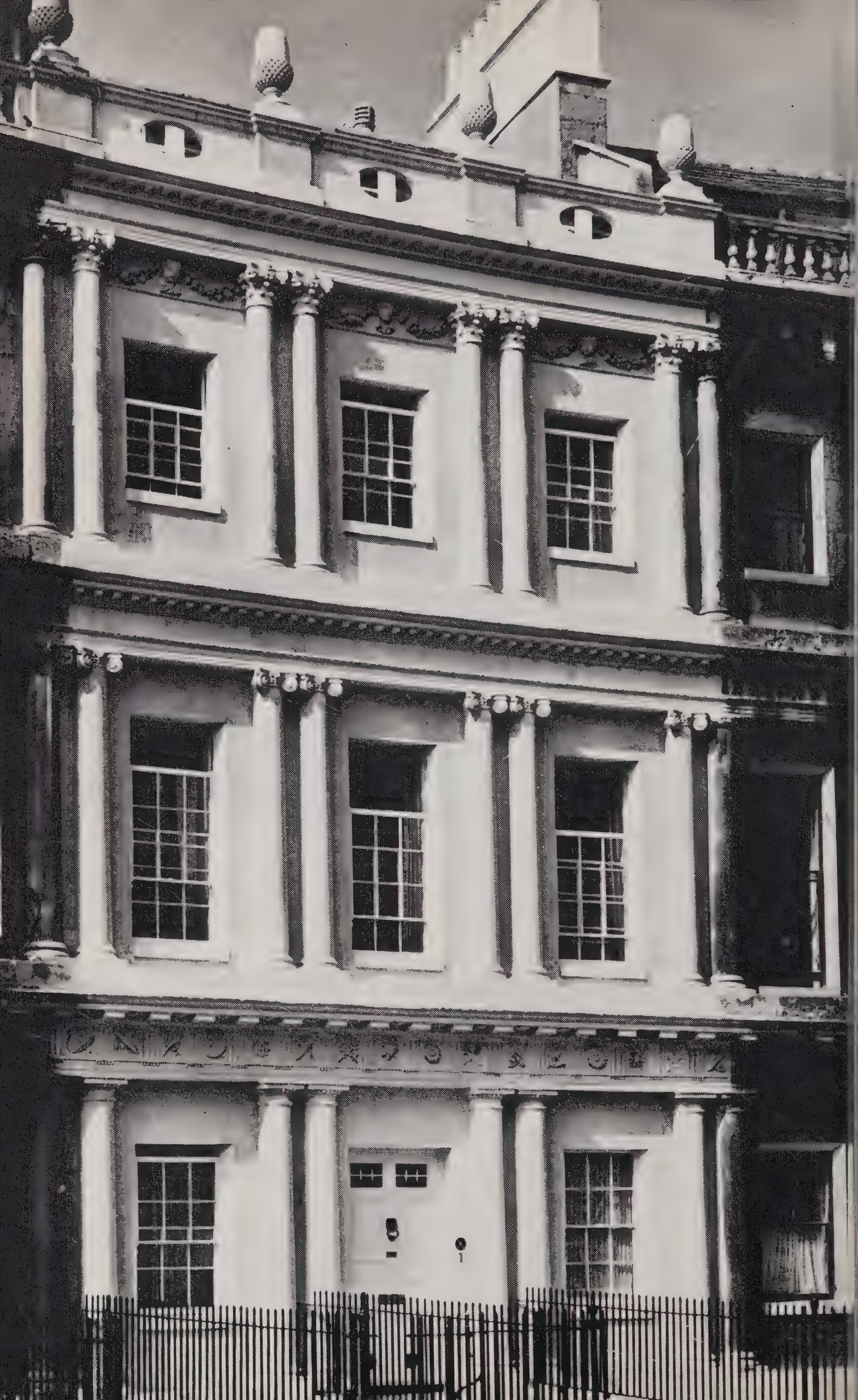

Ships, towers, domes, theatres and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

If and If and If

THE Minister of Power's report on domestic fuel supplies and clean air policy, and the related Circulars from the Ministry of Housing and Local Government and the Scottish Development Department, are summarized and discussed on later pages. They are the most important statements on clean air since the Beaver Committee's report in 1954. The general attitude of the Society on the situation that has arisen is expressed briefly in a resolution, also recorded, that has been sent to all local authorities in the "black areas".

To discuss the situation constructively and in a forward looking way is not easy, partly because the reactions to it have not yet crystallized, and partly because there are so many variables involved. Thus it can be said that *if* local authorities and householders recognize that the higher initial cost of smoke control is well worthwhile; *if* the openable solid fuel room heater makes a breakthrough in popularity; and *if* the present trend to non-solid sources of heat continues—then the setting up of smoke control areas can continue at least as rapidly as before, and perhaps even faster.

These three "ifs" (and perhaps one or two of lesser importance) are the keys to the future of domestic smoke control, and they may be looked at more closely. The most serious is the first. Will the higher cost of conversion for smoke control slow down the rate of progress? In some cases, for the time being at least, we are afraid it will. A few authorities have already halted their programmes and others have slowed them down, to spread costs over a longer period of years. But, if the case is properly presented, and if the costs are weighed against the benefits of both clean air and possible fuel savings, it is obvious that the conversion cost will soon pay for itself —as can be seen from the diagram on page 207. Moreover, it is encouraging to see how the cost of conversions to the local authority and to the Exchequer are proving to be much less than the estimates. A survey for Greater London, carried out by the London and Home Counties Advisory Clean Air Council shows that for 131 orders, estimated costs of £1,619,417 turned out in actuality to be only £677,839. Two practical points on this stand out in the Ministry's circular. the one is the paragraph on the credit sale of new appliances, the possibilities of which should be carefully studied and encouraged wherever it is going to help; and the second is the provision of Exchequer assistance above the normal 40 per cent where an authority pays some or all of the householder's share. The Circular suggests that this will now become more frequent, and indeed there seems to be an implied encouragement to local authorities to help the needy more generously through this provision. As for the better-off, it seems ridiculous that there should be doubt about willingness to improve heating standards when so many are doing it anyhow, and the cost is a mere bagatelle for an affluent society that spends so much more on luxuries.

In short, any argument that the clean air programme should be slowed down because of cost does not hold water.

The Second If

The second "if" we mentioned is whether the openable solid fuel heater will succeed in taking the place of the open fire to the extent necessary to allow the programme to continue. (With these closable appliances must be included the underfloor draught fires, which though open will also burn the less reactive fuels.) We gather that the excellent new designs of room heaters are becoming increasingly popular, and not only in smoke control areas. Whether they are making the really hard impact we need is perhaps not so certain. We publish in this issue a special feature on these appliances which, with their glass fronts and good, slim design, are far more attractive than their forerunners. Taking into account the economy they can give (or the greater comfort), as Figure IV on page 207 shows so plainly, the prospects are that they can reach a high level of public esteem. What it needed is direct encouragement by the local authorities, a bigger and bolder advertising campaign by the manufacturers and the hard coke people, and price reductions in anticipation of the production savings that are always said to follow bigger output.

It must be remembered that although we are looking for much from the closed appliances, and much also from the non-solid fuels, there will still be a demand for the familiar open fire and a need for increased production of the more reactive fuels, and for all the open-fire coke that is available to be put on to the domestic market.

The Gap

The third "if" centres on the threatened gap between solid fuel demand and production that the White Paper judges will develop between 1965 and 1970. This is depicted on Figure I on page 204, and at first sight looks ominous. It would be, were it not for the increasing effect that the non-solid fuels—gas, electricity and oil—are creating. The trend is shown in Figure III, and although it cannot be said that it will become even more pronounced this seems to be more likely than not. The movement it reflects is very significant, and is of course due to the revolution in home standards that is in progress, in which heating standards are an important factor. It is a demand for greater comfort, greater convenience, more labour-saving and the need to keep up with the Joneses. As far as home heating is concerned central heating is making inroads, and apart from this (and so far on a bigger scale) the non-solid fuels are clearly finding increased favour. It seems pretty certain that they will close the threatened gap, or rather that they will ensure that it does not appear.

The three questions that appear to us to be the most important seem therefore to be capable of being resolved and making it fully possible to go ahead with smoke control. Needless to say, there are other factors that might bedevil our hopes in the future, including the difficulties that may arise over the whole domestic field if fuel consumption should expand at too fast a rate. It is not only a higher demand for each dwelling, but there is the steady increase in the total number of dwellings.

For this reason alone it does seem seem essential that a much more careful watch should be kept, by the Ministry of Power and perhaps others, on trends and future needs. This would be one of the important tasks for the Ministry that H. G. Wells once urged, and which is no nearer than ever it was, great though its need is in many fields—a Ministry of Foresight.

The situation will be fully discussed at the October conference (see page 227). In the meantime we would welcome letters or observations from readers.

EXECUTIVE COUNCIL'S APPEAL TO LOCAL AUTHORITIES

The Executive Council of the Society, at a meeting on February 13, 1964, adopted the following statement and resolution, which it is submitting to all local authorities in the "black areas".

CLEAN AIR POLICY

The Executive Council of the National Society for Clean Air has considered the Ministry of Power's review of "Domestic Fuel Supplies and the Clean Air Policy", and the Circular "Clean Air Act, 1956: Smoke Control Areas" (No. 69/63) of the Ministry of Housing and Local Government, and Circular 58/1963 of the Scottish Development Department.

While regretting the problems that must arise in maintaining the progress of the smoke control area programme, the Executive Council recognizes that technological developments make changes inevitable and that, despite immediate consequences, these will in the long run be of benefit to the movement for clean air.

The Executive Council wishes to stress that the additional effort and cost of establishing smoke control areas is still far outweighed by the burden of smoke pollution upon every urban community, in terms of health, amenity and economic cost: the greater part of which today is due to domestic emissions.

The Executive Council therefore urges all Local Authorities in the "black areas":

(1) To press on with the steady establishment of smoke control areas in accordance with the provisions of the Clean Air Act, 1956;

(2) To recognize and take advantage of the fact that the new arrangements that are called for are in close accord with the growing public demand for higher standards of heating comfort and convenience, and to emphasize and encourage this in their explanatory publicity;

(3) More generally, because experience has shown that a well-informed public willingly accepts smoke control, to develop and extend as may be necessary their publicity and educational efforts to meet the new circumstances.

The Executive Council is conscious of the need for the Society to maintain to the full, and to develop as far as its resources will allow, its own activities and initiatives and is confident that in this it will continue to be given the full support of all its members, and trusts that Local Authorities will avail themselves of its services.

Carless Zones Again

The article in our Autumn 1963, issue, on what for want of a better term were called carless zones, seems to have won some approval and was given some useful publicity in the Press. The theme was that there should be a drive for creating in suitable parts of towns, villages and places of recreation, areas from which all engined traffic would be barred. Instances, from Europe, of such cases were given as examples. We find that such carless zones exist more than we had thought, and that more are contemplated, even though for the most part they are relatively small, such as pedestrian precincts in the centres of towns being built or re-developed—excellent as far as they go, but much too constricted. The idea is clearly growing in many quarters, though as far as we know it had not been previously looked at especially from the clean air point of view.

The prospect of creating traffic-free areas of worthwhile size in a crowded, built-up, traffic-choked city such as London seemed rather dim, even though it is in such cities that amelioration of this kind is most necessary. It was therefore with enthusiasm that we read the proposals made by Robert Harling in the *Sunday Times* (January 12, 1964) for converting Leicester Square, including three streets that lead from it, into an oasis free from traffic. The author stresses the amenities that this excellent scheme would provide, but even he does not mention the importance of an area free from the exhaust fumes of petrol driven cars and diesel driven taxis. A sketch, from the newspaper, of this imaginative scheme, is reproduced on another page.

That the possibilities of such clean air enclaves will receive more and more attention is certain, though one fears that the need will continue to build up faster than anything to alleviate it. The Buchanan report on traffic has focused public attention as never before on the mess we are getting into, and on how this will become even more desperate unless much more is done, and done soon, to deal with it. The question of carless zones is perhaps only a minor one compared with the growing congestion on the roads where traffic must be, but it is precisely because the major consequences of traffic growth are so appalling that thought should be given to opportunities for escaping from it. That is one reason why we should be interested in and ready to support the suggestion made by Professor Buchanan for a "Central Council for Physical Environment" made by him in a challenging article in the *Observer* (January 20, 1964) entitled "How Britain could be Saved". Such a Council might be of great value to the clean air movement, in all its aspects, for what element enters into the environment more universally and more intimately than the air we breathe?

Although more may be done in the future to make exhaust fumes less obnoxious, the plain facts are that most of our streets will be filled for years to come with vehicles emitting combustion products into the air at ground level. To be able to get away from it all, even if only for a short time, may be only one reason for such proposals as that for Leicester Square. Is this something that the N.S.C.A. should actively concern itself with, something to watch with merely passive approval, or even something to ignore? This is a matter on which we would be very glad to have the views of readers.

Two New Acts

We welcome two new Clean Air Acts. One, that for the United States, has a more sonorous full title, but its final section declares that it may be cited as the Clean Air Act. The other (although only a Bill as we go to press), is for Northern Ireland, where our own Division has played a useful part in the discussions that have led to its introduction. Both laws are discussed more fully on other pages. It will be seen that the U.S. Act is very different from our own, and has different purposes, but that the Northern Ireland Act is almost identical with the existing U.K. legislation, with one or two interesting differences. What we find somewhat fascinating is the new clause that gives the Ministry power to make regulations to reduce or control gaseous emissions (*i.e.*, sulphur dioxide) when means exist for doing so. This is identical in purpose, and as far as we recollect very similar in words, as the clause the Society sought to have included in the Clean Air Bill when it was before Parliament in 1955. We were given to understand, by the legal pundits, that such an anticipatory provision was not possible!

N.S.C.A. News

We congratulate Mr. R. J. Stanyard, the Hon. Secretary of our North West Division on a new appointment, although we regret that this takes him out of both the clean air field and our north west area, and that he has therefore to give up the office for the Society he has filled so very successfully. The new Hon. Secretary is Mr. W. H. Pollitt, C.P.H.I. of Audenshaw, to whom we extend our good wishes. Good wishes also to the new Hon. Secretary to the South East Division, succeeding the late J. J. Matthews. He is Mr. John S. Hodgins, C.P.H.I. for the Hayes and Harlington U.D.C. Readers may recall his thoughtful contributions to clean air problems in the pages of this journal.

The Society's Director, and Editor of this journal, has been honoured by election as a Fellow of the Institute of Fuel. He has been a Member of the Institute for many years and has made a number of contributions—all on air pollution—to its meetings and journal.

CLEAN AIR POLICY NOW

The White Paper, the new Circular, and their Consequences

THE publication of the White Paper on "Domestic Fuel Supplies and Clean Air Policy",[1] has set doubts at rest about the direction of the path that the smoke control area programme must, of necessity, take from now on. With it comes also Circulars from the Ministry of Housing and Local Government and the Scottish Development Department[2] in which the new policy begins to be put into practice—by amendments to the Clean Air Act itself (a Housing Bill being conveniently available for this purpose) and by revision of grant arrangements.

The White Paper is a cool and methodical analysis of the difficulties that have arisen and examination of the steps that must be taken if clean air progress is to continue. That it *can* continue is evident from the White Paper and its implications. That it *will* continue depends very largely on the Government and the local authorities. We therefore welcome the firm assurance made in the third paragraph of the Circular:

> **"It remains the Government's intention to encourage and facilitate vigorous action against urban smoke pollution . . ."**

and that in the light of the reassessment that has been made the new arrangements are necessary:

> **" . . . to ensure the continued smooth establishment of smoke control areas."**

And, despite the understandable sense of frustration and pessimism that has been engendered among many local authorities, including some which have been most determined to make progress, we trust that they will recognize that the new conditions that have arisen have to be accepted, that they will call for new thinking and bolder decision, and that smoke control need neither be halted nor slowed down.

The root of the problem that has developed is simply that solid smokeless fuels for open fires are not going to be in sufficient supply in the future if open fires continue to be installed in quantity in new smoke control areas.

It has been said that this should have been foreseen earlier, before so many plans and estimates had been made. There may be some substance in the criticism, but the fact is that a number of possible developments in the gas industry all happen to have come off at around the same time, and that all lead to reduced coke production. The White Paper discusses suggestions that have been made for slowing down the movement from coal carbonization and rightly says that this could be done only at the price of more expensive gas, and in time of more expensive coke too. There will of course be plenty of open-fire coke for many years to come, even if insufficient for all potential needs, and it is not to disparage it to say that we must accept the fact that for the final success of the clean air movement gas must begin to be regarded as the more important fuel. (The fact that it is virtually sulphur-free is not the least among its virtues.)

The quantities of solid smokeless fuels estimated to be available, on producers' existing plans, are given in Table II, in Appendix II of the White Paper. The salient facts are clearly

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[1] Cmnd. 2231, Presented to Parliament by the Minister of Power, Dec. 1963. H.M. Stationery Office. 20 pp. 1s. 6d. net.

[2] Circular No. 69/63. Ministry of Housing and Local Government. (Clean Air Act 1956, Smoke Control Areas). H. M. Stationery Office. 12 pp. 1s. net, and S.D.D. Circular 58/1963.

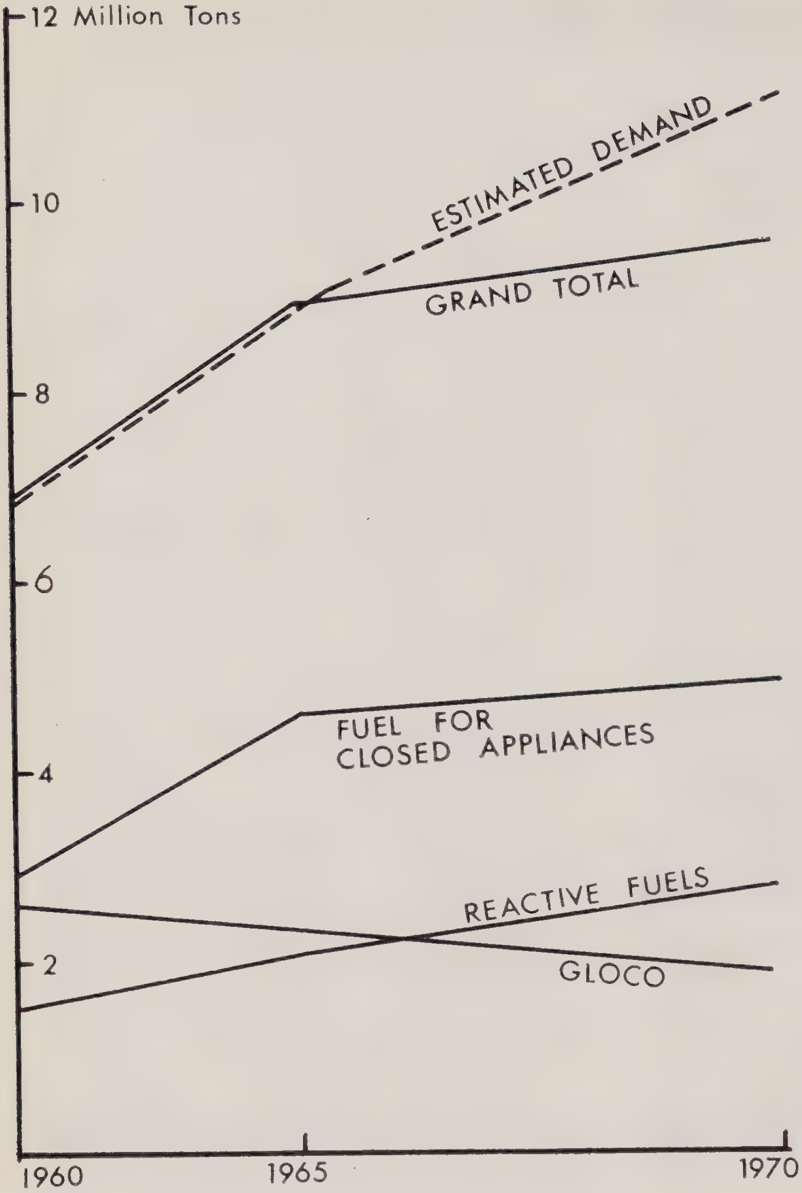

Fig. I. Production and demand estimates to 1970 of the main classes of solid smokeless fuel

shown in Figures I and II, derived from the Table.*

Figure I shows the estimates for the three main groups of smokeless fuel, together with the grand total and the estimated demand in 1965 and 1970. Figure II shows the estimates for the various named fuels. It will be seen that there will be a gradual decline in the production of open fire gas coke, or Gloco, and also of the reactive gasworks fuels, Cleanglow and Phimax. Despite increased production of the other smokeless fuels there is estimated to be an overall deficiency by 1970 of about 1½ million tons of solid smokeless fuel.

The conclusions on solid fuel demand and supply reached in the White Paper (para. 7) are as follows:

- **(a) There should be about enough smokeless solid fuel in total in 1965, but soon after 1965 there may be an overall shortage.**
- **(b) There are quality difficulties, supplies being particularly short in the reactive fuels suitable for use in improved or unimproved open grates. The deficiency may be nearly half a million tons in 1965 and is likely to grow thereafter.**
- **(c) If all the gas coke suitable for use in improved open grates (that is, Gloco) could be reserved for such**

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* These diagrams, and the others that follow, are not part of the White Paper but have been prepared especially for this article to illustrate the tables and figures in the White Paper, on which they are wholly based.

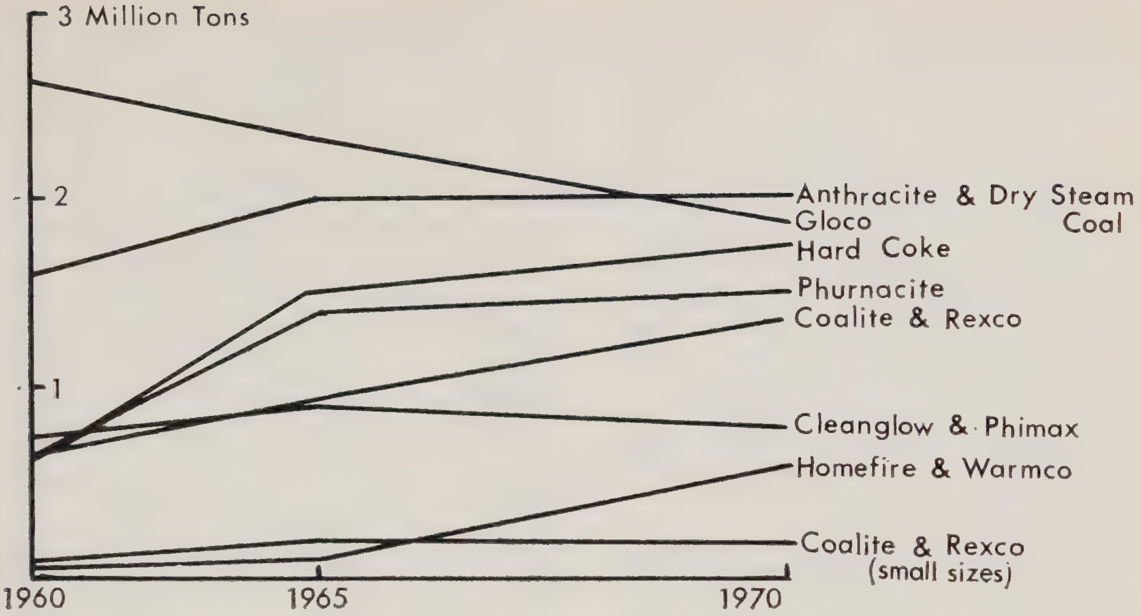

Fig. II. Production estimates to 1970 of named solid smokeless fuels

use, it would be just possible to meet the estimated demand for this kind of fuel in 1965 but, by 1970, there there would be a deficiency of about 1½ million tons.

- **(d) By 1970 the total shortage of fuels for improved and unimproved grates may be about two million tons a year.**
- **(e) Fuels suitable for use in closed appliances should be more than adequate to meet the needs of such appliances throughout the period.**
- **(f) In other words, although the total supplies of solid smokeless fuels should be sufficient to meet an increase in consumption of about 2½ million tons between 1962 and 1970 (which would allow the same annual rate of increase in consumption in the next eight years as in the past four) they may not meet the faster increase indicated by the present demand estimates. Moreover, to use these supplies, consumers may have to make greater use of closed appliances than hitherto.**

Then follows a paragraph that it is important to bear in mind, on the geographical problems that make it still more difficult to balance supply and demand:

"Supplies are spread unevenly over the country. Naturally smokeless coals and Phurnacite come from South Wales and domestic hard coke mainly from Durham, Yorkshire and North Midlands. The North Midlands and Yorkshire produce Coalite and Rexco but another plant to produce Rexco will shortly come into operation in Scotland. The availability of gas coke reflects the location of carbonization plant for making town gas and a particularly big fall in production of open-grate gas cokes is expected in the London area."

It is important also to note the warning, conveyed in a following paragraph: "While the trend is sufficiently clear to warrant corrective action, it is important to keep in mind the necessarily frail basis on which the estimates have been made."

The report then examines the possibilities of bringing smokeless fuel demand and supply into balance. The factors that may help to achieve the balance are examined separately, although some have to be dismissed as impracticable. From this analysis the following conclusions (para. 33), which are in effect the recommendations of the report, are reached:

- **(1) Adequate supplies of smokeless solid fuel for open grates will continue to be available to meet the needs of existing smoke control areas, including those confirmed but not yet in operation. Supplies, particularly of the reactive fuels, are, however, likely to fall in-**

creasingly short of requirements for new areas.

(2) Further efforts by producers to increase the output of open-fire fuel and to switch supplies from commercial and industrial users should improve matters. It is important that all the producers concerned should take such action as far as can be economically justified and should also examine the case for bringing demand and supply into better balance by price adjustments.

(3) Increased use of closed appliances (including openable stoves) and underfloor draught open grates is desirable.

(4) Gas, oil and electricity provide acceptable alternatives to solid fuels for a large proportion of householders in smoke control areas. These industries should have little difficulty in expanding supplies to the extent necessary to fill the gap in the supply of solid smokeless fuels although in the case of electricity it is desirable that space heating should be done by storage, and not by direct-acting appliances.

(5) The availability and attractiveness of the different smokeless fuels in relation to each other will vary from place to place. Local authorities should consult closely with the fuel and power industries before preparing smoke control orders.

Trends

One of the most important questions that arises is the extent to which the non-solid fuels will make good the threatened deficiency in solid smokeless fuels in the 1970 period. This is summarized in (4) above, and is discussed more fully in paragraphs 24 to 29 of the White Paper. A table (para. 24) shows domestic fuel consumption from 1950 to 1962, and from this, taking the three main groups, our Figure III has been constructed. Because the overall consumption of domestic fuel is steadily increasing (from 61·6 to 79·5 million tons of coal or coal equivalent during the period 1950 to 1962) and is certain to continue, if only because of the increasing number of dwellings, the share of each group in the diagram has been shown as a *percentage* of the whole.

The important facts that stand out are (1) the steady rise in the use of the non-solid fuels, (2) the decline in the consumption of coal (both in quantity and proportionately), and (3) the very small rate of change in the use of the solid smokeless fuels. If the trends are extrapolated to 1970 we would find 76 per cent of domestic heating being done by the non-solid fuels and the rest divided equally between coal and solid smokeless fuels. It would of course be rash to build too much on this, although at the present time it is likely that the rate of change to the non-solids fuel is curving up still more steeply.

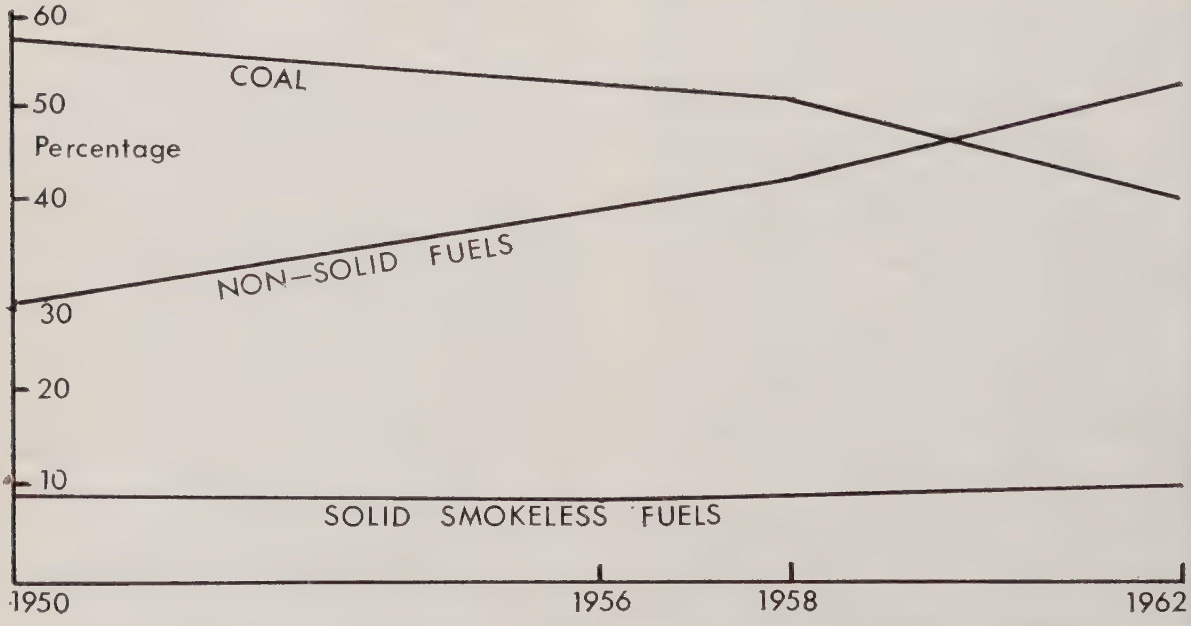

Fig. III. Domestic fuel usage, 1950-62, expressed as percentages of total

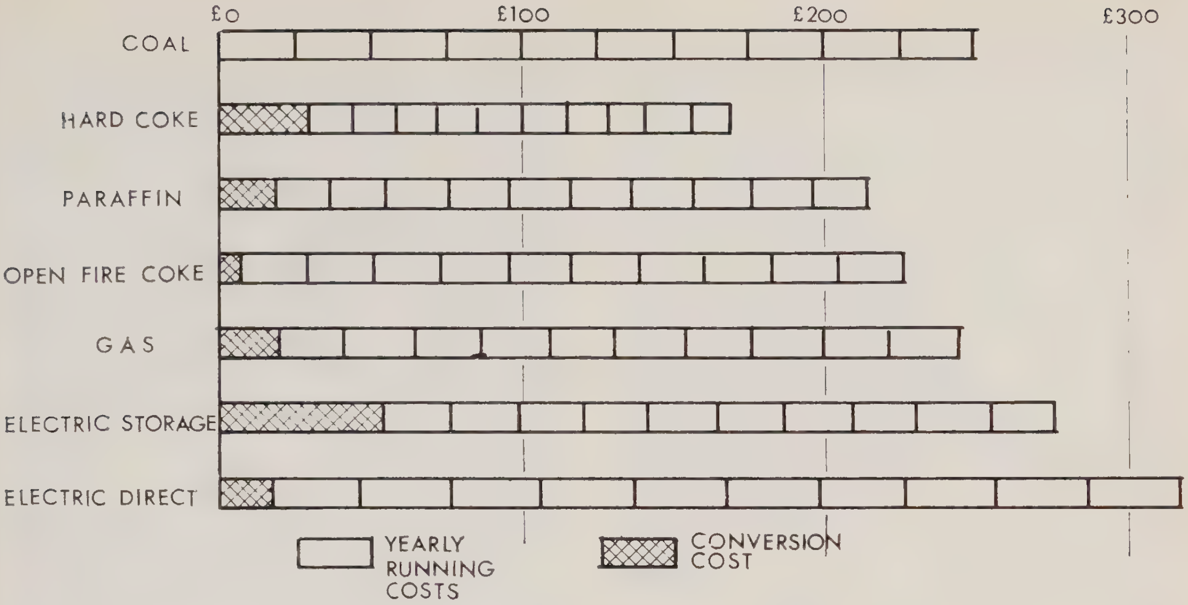

Fig. IV. Relative costs of heating by different methods, including conversion costs, from Table A of the White Paper. Further details are: Coal—on old-fashioned stool-bottom grate. Hard coke—in openable room heater. Paraffin—in fixed-flued heater. Open fire coke—in improved open grate. Gas—in radiant/convector heater. Electric storage—with two block-storage heaters. Electric direct—with electric fire. (*See also comment in text*)

The prospect of the solid fuel gap being closed by the non-solids by, or even before, 1970 is not at all unreasonable and is clearly a trend to be encouraged.

Costs

Finally, the White Paper, in its Appendix III, discusses the present costs of domestic space and water heating by alternative methods. This is one of the most important aspects of the situation to be impressed upon both the local authorities and the householders in proposed smoke control areas. One of the needs, as conclusion (3), quoted above, states, is to promote the use of closed appliances and underfloor draught fires using hard coke and other less reactive smokeless fuels. The higher cost of conversion to the openable stove or room-heater, is one of the difficulties, but the tables of comparative costs given in the White Paper demonstrate the ultimate economy that can be gained. Once again we have expressed the figures in graphic form, in Fig. IV. This refers to heating only, but the report also gives a similar table that includes the cost of water heating, using various combinations of appliances.

It will be seen from the diagram that, even when the conversion cost is taken into account, the openable stove shows a net saving in less than seven years. All the other methods, except direct-use electric fires, also show a saving over the coal fire after a varying number of years. The figures would be even more striking if the cost of conversion of the openable stove, and in particular the installation cost of thermal storage electric heaters, could be materially reduced.

It should be pointed out that Figure IV is based entirely on the figures given in the White Paper, and that it is necessary to take into account the explanatory text of Appendix III before the comparisons are used for more than illustrative purposes. In practice, for instance, some of the costs may be less than those shown—the actual consumption of gas and direct-use electricity is likely to be reduced because both lend themselves to intermittent heating.

The tables in the review, and the

diagrams based on them, show quite conclusively that not only benefits to cleaner air, but direct savings to the user, can accrue from the change over from coal fires. The cost of conversion is a small and worthwhile investment.

THE CIRCULAR

The Circular from the Ministry of Housing and Local Government, sent with a copy of the Ministry of Power's review to local authorities, sums up the situation, explains what may now be done, advises what should be done, and indicates what the Ministry has already arranged to assist.

On a detail about which there seems to have been some confusion, it stresses that although open grate gas coke can no longer be regarded as the main replacement for raw coal in *future* smoke control areas, "sufficient supplies of smokeless solid fuels for use in improved open grates will continue to be available to meet the needs of those living in areas already subject to smoke control, including areas covered by smoke control orders confirmed by the Minister but not yet in operation and producers and distributors will do all they can to ensure that these needs continue to be met.*

The general position is reviewed: the limited amount of premium fuels available, even after the expected substantial increase in production; there are abundant supplies of hard coke in most areas for use in closed appliances, boiler and underfloor draught fires; new types of appliance and price trends are making the non-solid fuels increasingly competitive; and when electricity is chosen off-peak thermal storage heaters should be encouraged and direct-use electric appliances discouraged.

Consultation

The Circular continues with an important paragraph stressing the need to take full account of the local fuel situation in preparing future smoke control orders, and the advice to local authorities to discuss the proposals with the fuel and power producers given when the Act first came into operation has now been reinforced. To quote:

"In the case of all solid smokeless fuels other than Coalite, Rexco and fuels produced by the gas industry the National Coal Board have arranged that advice will be available from their Regional Sales Managers shown in Appendix I. The Area Electricity and Gas Boards have nominated the senior officers listed in Appendix II and Appendix III respectively to take special responsibility for advising local authorities about electricity and gas supplies for smoke control areas. Inquiries about the availability of Coalite and Rexco may be made to the persons named in Appendix IV. Local authorities contemplating the making of a smoke control order should consult as appropriate at an early stage these representatives of the producers and the representatives of the solid fuel distributors shown in Appendix V. If substantial amounts of oil are likely to be involved the local distributors of oil products should also be consulted. In some areas a convenient means of consultation with the fuel suppliers and distributors may be for several local authorities to form a joint committee for the purpose."

The Circular continues by asking that the consultations should be reported to the Minister when the order is submitted. This will allow the Minister to satisfy himself that the necessary fuels will be available, if necessary after consultation with the Minister of Power.

Revised Grant Arrangements

After referring to the wording of Section 34(6) of the Clean Air Act, which permits grants to be made on "reasonably necessary" works of adaptation, the Circular states that in view of the White Paper the Minister considers that "the installation of openable stoves, underfloor draught open fires or fixed gas, electric storage or oil heaters should now be regarded as 'reasonably necessary' works and that the full expenditure on such installations should rank for grant"—subject of course to other conditions.

Subject to fuel and power availability householders should for grant purposes "be given freedom of choice as between appliances using solid fuel, gas, electricity and oil."

In a proposed smoke control area where supplies of open fire coke will not be available, grants will not be paid for the installation of improved open fires, but may be made for the replacement of existing fires of this type by other appliances.

Legislative Changes

Certain changes made desirable by the new situation will require legislation, and amendments to the Clean Air Act have therefore been included in the Housing Bill at present passing through Parliament. The Circular describes these amendments. One concerns "new dwellings". Under the Clean Air Act dwellings begun to be erected after July 5, 1956, could not rank for conversion grants, and under a bye-law which many local authorities obtained, appliances suitable for smokeless heating were required to be installed in new dwellings. This will be no longer equitable if supplies of suitable fuel can no longer be assured. The new legislation will remove this restriction but (for the same reasons as before) will impose a similar restriction in respect of dwellings the erection of which is begun after the enactment of the present Bill.

Another important change will be to enable the Exchequer to contribute more to the grants payable in certain cases. Because of the higher cost of conversions to be expected it is considered that there will be an increase in the number of cases where discretionary repayments will be necessary to prevent hardship. In such cases the Minister may contribute towards the local authorities' added expenses.

Another clause will enable local authorities, and the Minister, to withhold grant for any appliances that might unduly strain fuel resources.

The new Bill will also make it possible for grants to be made on portable means of ignition, such as gas or electric pokers, even if no "works" are involved—a condition laid down in the Clean Air Act. Finally, under the Clean Air Act it has generally been construed that a local authority must approve conversion expenditure before it is incurred. This sometimes causes difficulty, and it is proposed in the new Bill to empower local authorities to approve retrospectively expenditure incurred without their approval—provided as at present it is incurred after the relevant order has been confirmed and before it has come into operation.

Credit Facilities

The higher cost of conversions means more financial problems, and a paragraph in the Circular describes how credit facilities for purchase of heating and cooking appliances may be adopted and encouraged. Other points to note from the Circular are that a new building regulation made under section 24 of the Clean Air Act, as amended, is receiving urgent attention; and that an approved list for electrical storage heaters will be issued when tests of new heaters have been completed. There is no approved list of oil-burning appliances, but domestic oil heaters not designed for use with a flue must comply with the Oil Heaters Regulation 1962. It is pointed out that to rank for grant oil heaters, like other appliances, must be fixed and "works" must be involved. The bolting or screwing into the hearth of a heater would, in the Minister's view, enable it to comply with this condition.

The Effect of the Changes

The final paragraphs of the Circular may be quoted in full:

> "The Minister recognises that the initial effect of the changed fuel position as set out in the Minister of Power's review, may be to make it more difficult for local authorities to establish smoke control areas. From now on a greater change in householders' heating arrangements will often be necessary, and greater efforts may well have to be made to

persuade householders of the need for the change. But householders will still have a wide choice of appliances and fuels; for most people the cost of fuel need be little, if at all, greater; and more money will often by payable to the householder by way of grant and heating standards will be improved.

"The Minister and the Minister of Power will continue to keep the fuel situation under review so that if further changes in arrangements become necessary they can be introduced as soon as the situation requires."

The Causation of Lung Cancer

Controversy over the factors responsible for the rapid increase in lung cancer in many parts of the world continues. The recent U.S. report, which lay the blame squarely on cigarette smoking, was followed by a statement about the forthcoming report of a West German medical inquiry, which apparently finds that cigarette smoking had practically no significance, although it did shorten life by inducing heart and circulatory troubles. Investigation had shown (*Guardian* report, January 12, 1964) that "the majority of cancer victims were drivers of motor vehicles or industrial workers in areas where there was particularly heavy atmospheric pollution".

Published in December, a World Health Organization report from its expert committee on the prevention of cancer, includes both smoking and air pollution as causative factors in lung cancer. On air pollution the report states: "Evidence points to a consistently increased incidence of lung cancer in urban as compared with rural areas, which cannot be explained by differences in smoking habits".

A South African investigation, conducted by a tobacco group, declares its findings to be in line with the German investigation. It finds that the lung cancer rate at Bloemfontein is one-quarter that of Durban (*Cape Argus*, January 13, 1964). Bloemfontein has few industries, one-third of the population of Durban, and at 4,600 feet above sea level enjoys dry and clean air. "Durban", it is quoted, "is an industrial city with factories, trucks, diesel buses and trains. Furthermore it is situated at sea level, is far more humid and often plagued by smog".

These statements add weight to the belief that air pollution is a not inconsiderable factor in the incidence of lung cancer, even though there are other findings (such as the high level of the disease in pollution-free Finland) which appear to point in the opposite direction. But, just as the evidence for associating lung cancer with air pollution is not certain proof, neither do such discrepancies provide disproof. It is pretty certain that lung cancer is promoted by a multiplicity of causes, some of which may be unimportant or even absent in some instances, and yet of high importance in others.

The Economics of Air Pollution

The Society of Chemical Industry is instituting an inquiry into the technological and economic aspects of air pollution, under the direction of Mr. Allan R. Smith, late head of the statistics department of Imperial Chemical Industries Ltd.

B.S. on Sulphur Measurement

The British Standards Institution has issued Part 4 of the series Methods for the Measurement of Air Pollution—the Lead Dioxide Method. (B.S. 1747:Part 4:1963. From the Institution at 2 Park Street, London, W.1. 5s. net). This is the well-known "sulphur candle" method, in which a porcelain cylinder is wrapped with a cloth coated with a paste of lead dioxide, mounted in a louvred box, and exposed for a month or other period. The standard gives specifications for the apparatus, the reagents, preparation of cylinders, installation, and analytical procedure. The value and limitations of the method are discussed.

CLEAN AIR BILL FOR NORTHERN IRELAND

by W. E. C. O'Brien

(Hon. Secretary, N. Ireland Division, N.S.C.A.)

On Wednesday December 5, 1962, the Minister of Health and Local Government made a Statement to the House concerning a matter—Clean Air—mentioned earlier in the Queen's Speech, indicating that it was the Government's intention to introduce legislation to deal with the air pollution problem, and that his Department would shortly be circulating to Local Authority Associations, the Northern Ireland Division of the National Society for Clean Air, and other interested bodies a memorandum which would form the basis for consultation on proposals for legislation.

The Divisional Council welcomed this Statement and has taken a full part in these consultations and very good relationships have now been established with the Ministry. On some of these consultations we were accompanied by our President, Dr. A. Parker, Mr. W. Combey of Oxford, and the Director, Mr. Marsh. It was good to have the benefit of their knowledge and advice.

On Tuesday, January 21, 1964, the Minister presented to the House the Clean Air Bill which formally received the first reading, the second reading of the Bill took place on February 13 and it is expected the Bill will receive the Royal Assent in May.

The Bill follows the pattern of the 1956 Act, although in some respects it goes further, and in drafting the Bill regard was had to the amendments to the 1956 Act included in Clause 90 of the Housing Bill presented in Westminster last November.

There are, however, two entirely new clauses of interest. One gives the Minister power to make regulations to control the emissions of gases (*e.g.* sulphur dioxide) from a chimney when he is satisfied that practicable means exist for so doing. The other says it shall be part of the functions of a local authority to report to the Ministry of Home Affairs cases where "an authorized officer reasonably suspects that a motor vehicle is so used as not to comply with regulations" made under the section of the Road Traffic Act (Northern Ireland) that is concerned with smoke and other emissions; and that "it shall be the duty of that Ministry to cause the matter to be investigated".

The Air Pollution problem in Northern Ireland is not quite so extensive and so serious as it is in other parts of the United Kingdom, it is hoped that over the next few years good progress will be made in resolving the problem. The main part of the problem is in the Greater Belfast Area which includes nine Local Authorities. We, in Northern Ireland, will have the great advantage of learning much from your experience of the 1956 Act which will be invaluable to us in dealing with any difficulties which may arise.

The Ministry of Health and Local Government is relying to a large extent on the co-operation of the National Society and full use, will I am sure, be made of our resources.

As a Division our immediate task must be to create a sense of urgency and a public awareness of the problem.

The Divisional Council is arranging a one-day Conference later this year for Local Authorities, other Public Bodies, and Industrialists, etc. It is hoped the Minister will come to the Conference and be the principal guest at a Luncheon, we would also wish to have with us on this occasion our President and Director of the Society.

The introduction of Clean Air

legislation will I believe, mean a greater Northern Ireland interest in the work of the Society, and a stronger representation at the Society's Annual Conference.

ANY QUESTIONS IN BLACKBURN

A successful and well-attended meeting of the North West Division of the Society was held in the Town Hall at Blackburn on December 12. It took the form of an "Any Questions" session, on "Problems arising in smoke control in the North West", arising from the letter to the local authorities in that area from the Ministry of Housing. The White Paper and Circular 69/63 had not been published at the time of the meeting.

A representative panel was on the platform to answer the many and mostly pertinent questions that came in a lively stream from the floor. It consisted of N. H. Bridge (N.W. Electricity Board), H. Giblin (Solid Smokeless Fuels Federation), R. Lydiatt (Lancashire and District Coke Distributors' Association), J. Pye (Blackburn C.B.), J. W. Rodgers (N.W. Gas Board), and A. Taylor (National Coal Board). The Chairman was the Director of the Society, Arnold Marsh. The meeting was opened by an address of welcome by the Mayor of Blackburn, Alderman F. Wilkinson.

Bristol and West Clean Air Committee

At their Annual General Meeting in the Pump Room, Bath, members of the Bristol and West Clean Air Committee stood in tribute to the memory of their former Secretary and Chief Public Health Inspector of Bristol, Mr. F. J. Redstone.

The Assistant Secretary, Mr. G. W. Dhenin, later reported on a children's competition organized through the kind co-operation of the *Bristol Evening Post* to judge the order of importance of ten statements about clean air, for which the Director of the National Society for Clean Air had provided the key solution, and to give their reasons for the priorities. There had been nearly a hundred entries, the majority from girls.

Alderman G. P. C. Ford of Bristol was re-elected Chairman, and Mr. H. W. Nation of Bath, Vice-Chairman of the Committee. Messrs. R. V. Redston and G. W. Dhenin, of Bath, were elected Secretary and Assistant Secretary, respectively.

There followed a conference on "Clean Air and the Community", to which the Mayor of Bath, Councillor Royston Tucker, welcomed Councillors and representatives of a number of local organizations, as well as senior students from Bath Domestic Science Training College and the City of Bath Girls' Grammar School. Mr. H. W. Nation presided.

Speaking on the medical aspects of air pollution, Dr. Marjorie Clifton, of Warren Spring Laboratory, described a survey on bronchitis carried out in the Sheffield area, illustrating her talk with colour slides.

Mr. R. V. Redston, Chief Public Health Inspector of Bath, spoke on the causes and environmental effects of pollution, the latter being illustrated by a display of photographs, including a number showing damage to stonework of Bath Abbey and its restoration, and the striking contrast between cleaned and smoke blackened houses in the famous Circus. (*See frontispiece photo, page 198—Ed.*).

The discussion, opened by Dr. Hutchby, Assistant Medical Officer of Health of Bath, provoked a wide response with contributions from, among others, the Public Analyst of Bristol, Mr. E. G. Whittle; the Chairman of the Bath Housing Committee, Alderman S. Smith; Councillor Mrs. C. I. Rossiter of Mangotsfield; Mr. P. K. Pope, A.R.I.B.A., Mr. Reynolds of Bristol College of Advanced Technology; Mrs. Trevillion of Bristol, and a Grammar School girl, Miss Dorothy Brown.

INDUSTRIAL POLLUTION FALLING

Society's Inquiry

The difficulties being encountered in implementing the domestic provisions of the Clean Air Act tend to obscure the steady progress being made in the reduction of industrial pollution as a result of the Act. In an attempt to confirm the general impression that this is now substantial the Society a few months ago sent to all local authorities a short and simple questionnaire. Replies were received from 558 of the 1,714 authorities approached——just 33 per cent.

The main questions asked were for estimates of the present emission of smoke, and of grit and dust, from industrial sources, compared with 1956, It was realized that little or no precise data would be available and the estimates were asked for in terms of rounded percentage changes. The replies amply confirmed the belief that there has been a considerable reduction in smoke, and showed that there had been more improvement with respect to grit and dust than had been expected.

It is not statistically possible to express the mean of a series of percentages, which are based on varying quantities, unless each item is properly adjusted, and for this there is insufficient data (and it would be a lengthy and hardly necessary process). But examination of the tables that have been constructed from the replies shows a consistency in the degrees of improvement which is unmistakable. The conclusions are:

(1) Industrial smoke emission is now almost one-half that of 1956.
(2) Industrial grit and dust emission is now about three-fifths of that of 1956.

The Reasons

The questionnaire invited statements on the principal reasons for the observed changes. A considerable number of different reasons were given, the most frequent of which are summarized in the following list. (These are *principal* reasons: others may have been cited).

Modernization of plant and techniques	171
Change of fuel to oil	153
External influences*	78
Closure of plant	52
Change to electricity	33
Grit and dust arrestment	21
Change to better coal	15
Change to gas	9

* The item "external influences" sum up a variety of reasons that include the existence of the Clean Air Act, public opinion and publicity, pressure, supervision and enforcement by the local authority and alkali inspectorate, and awareness of fuel efficiency and its relation to smoke prevention.

Only six replies showed that conditions had worsened, because of industrial developments.

Continuing Difficulties

A question asking for information of the principal difficulties remaining to be resolved again brought a considerable variety of replies, the most frequent of which were as follows:

Operational and staff	37
Obsolete plant	30
Grit and dust	26
Iron and steel	24
Cement and bricks	22
Railways	16
Smells and wastes	16
Power stations	15
Scrap treatment and incineration	13

The Industries Responsible

The table above shows that in most cases the principal difficulty was given in terms of specific industries. A further question however asked directly for the industries principally responsible for continuing pollution. This produced a more detailed list. In giving this list it should be emphasized that the figures merely show the number of times an industry was mentioned and is not related to the actual number of units in each industry, so that the list does not form a table of merit (or demerit). There are, for example, very many laundries and very few oil refineries. With this proviso in mind the information given is of considerable interest.

Light industry (mainly laundries) . .	73
Iron and steel	59
Bricks and ceramics	45
Rural industries (quarrying, limestone, dairy factories, etc.) . .	37
Textiles	33
Timber, furniture, etc.	30
Gas works and coking	20
Railways	22
Power stations	22
Cement	13
Engineering, etc.	12
Hospitals	12
Chemicals	11
Breweries	11
Tanneries	7
Metal recovery and smelting . .	7
Collieries	6
Asphalt	5
Oil refineries	2
Shipyards	2

How Many Chimneys?

Another question asked how many industrial chimneys there were in the authority's area in 1956, and how many there are now. The answers are of interest from the clean air point of view and also as a pointer to the general industrial changes that are occurring in the country. In all, among the authorities replying, the number of chimneys have increased by a small fraction—from 20,689 in 1956, to 21,602 in 1963. The returns have been broken down according to the Society's Divisions, and we find that the number of chimneys has increased in all regions except two. The increases are not significant except in the case of the West Midlands, which shows a rise of 443 from 5,022, or nearly 9 per cent, and in the South East, which shows a rise of 701, from 3,541—or over 18 per cent. The decreases are, a small one of 19 for Yorkshire, and a major one of 500 for Scotland—from 4,327 to 3,827, or a fall of 11·3 per cent. It must be remembered that these figures are based on returns from one-third of the local authorities only.

Fuel Changes

The remaining question asked in the questionnaire was on changes in the industrial consumption of coal and oil, as far as it might be known. An indication of trends, rather than any precise statistics, was sought, and although the answers were not always complete or in the form desired, they do give a broad picture of some interest. From the replies as a whole industrial coal consumption has diminished from 7·48 to 6·81 m. tons per annum, while oil has increased from 1·46 to 3·33 m. tons.

As mentioned, the returns have been analyzed on a regional basis, and duplicated copies of any of the regional tables are available.

In conclusion, the opportunity must be taken of expressing our thanks to the 558 Public Health Inspectors (to whom the questionnaire was addressed) for the trouble they took (sometimes obviously very considerable) in completing and returning the form.

The Cost of Smoke Control Grants

The inquiry on smoke control area conversion costs mentioned in our first editorial article was recently carried out by the London and Home Counties Clean Air Advisory Council, a body representing local authorities in the region. 89 authorities replied to the inquiry, of which 26 had not made smoke control orders. The remainder gave figures for the amounts that might have had to be paid to owners or occupiers in complying with an Order, and the actual amounts claimed. Also asked for was information no what arrangements had been made to comply with the Order when no claim had been made.

Figures are given for 131 Orders, and in only one case was the actual cost greater than the estimate. The estimates totalled £1,619,417, and the actual cost to the local authorities was £677,839.

A column in the report giving remarks and comment contains so much varied information that summary is not possible. But the point most frequently made, in different ways, is that in many cases smokeless conditions had been obtained in advance of the smoke control order, or that the necessary changes had been made without reference to, or claim upon, the local authority, or that premium fuels were being used in existing open grates.

On what action is taken, it appears that householders are advised that they can make a claim if they wish to, but after that it is up to them. One authority puts it succinctly: "Householders' responsibility not to create smoke; how this is achieved is their own affair". Some references are made to action taken if contraventions should occur, but it appears that this is informal; there is no definite information about proceedings being taken.

In some cases it is stated that only one-third of householders affected apply for grant, and although actual numbers were not asked for and are not generally given, it would appear from the sums involved that only 40 per cent of possible claims are made. This may, of course, apply only to this particular region—which happens to be the one where smoke control is making the best progress.

C.B.E.

We extend our congratulations to Councillor F. V. Magness, Chairman of the Willenhall U.D.C., and of the West Midlands Division of the Society, for the honour of being appointed as a Companion of the British Empire.

Air Pollution in the South Seas—a cement works at Suva, Fiji Islands
(*Photo:* "*Pacific Islands Monthly*")

Get in on the CLEAN AIR ACT– with ELECTRICITY

Electricity provides the cleanest heat there is—there is no dirt, smoke or fumes. That is why it makes a unique contribution to the Clean Air Act. And now it does this in new and exciting ways.

Electric central heating for everyone. New Unit-plan heaters are very cheap to buy and install (from about £60 for two heaters). And, because they use electricity at off-peak rates, very economical to run. Another form of electric central heating, which also uses off-peak electricity, is electric floor warming.

Plenty of hot water cheaply: the fixing of an immersion heater is the simplest and cheapest way of adapting an existing water heating system. Electricity heats water swiftly, cleanly and, provided there is efficient lagging, economically.

Modern electric cooking is fast and clean. Electric cookers keep kitchens clean and free of condensation, mean less redecoration. And electric cookers are now *fast*. The new radiant rings and lightweight boiling plates heat up (and cool down) in a matter of moments.

Ask your Electricity Board for the free leaflet "When your neighbourhood becomes a Smoke Control Area . . . here's how Electricity can help you", or write to the Electrical Development Association (P/NTa), 2 Savoy Hill, London, W.C.2.

INTERNATIONAL SECTION

AIR POLLUTION IN SOUTH AMERICA

by

E. T. Wilkins, M.Sc., Ph.D.

Dr. Wilkins, formerly of the Fuel Research Station, will need no introduction to many of our readers who have been concerned with the Investigation of Air Pollution. We are pleased to be able to publish the following account of a recent air pollution mission he made to South America, based on his report to the British Council.

THE First Latin-American Conference on Air Pollution was held in Buenos Aires from October 29 to November 2, 1962. One objective of the visit, which was made under the auspices of the British Council and the Argentine National Institute of Industrial Technology (I.N.T.I.), was to take part in this Conference and to present papers on Britain’s Clean Air Act and on the scientific control of air pollution. A second objective was to examine the air pollution problems in Buenos Aires and to make recommendations on the establishment of a scientific centre for their investigation and control. Subsequently, at the request of the Inter-Municipal Commission for the Control of Air and Water Pollution in Sao Paulo (C.I.C.P.A.A.) and the Institute for Sanitary Engineering in Rio de Janeiro (S.U.R.S.A.N.), arrangements were made for a short visit to these areas to discuss some of their air pollution problems.

The calling of the Conference was a recognition of the growing menace of air pollution in many parts of South America, of the need for reviewing and co-ordinating the activities of the various organizations working in this field and for stimulating new activities. About three dozen papers were presented, the majority from Argentina, the remainder from Chile, Peru, Uruguay, the U.S.A. and the U.K. (mine only); participants in the Conference came also from other South American countries. The papers were dealt with mainly under the headings—fuel-burning installations, special processes, motor vehicles, investigation and control, biological effects, town-planning and legal aspects.

The scientific study of air pollution is as yet in an early stage of development in South America and so there is a special interest in techniques for determining its nature and extent. The papers from the U.S.A. and my own were largely concerned with such techniques; these papers showed the extensive use which is made of relatively costly and complex instruments in the U.S.A. and the tendency for simpler methods to be used in the U.K. Bearing in mind that large amounts of money are not likely to be available for such purposes in South America, the relatively simple approach to many air pollution problems which is adopted in the U.K. should be of special interest.

A subject which received much attention at the Conference and during my subsequent discussions, was that of the methods which should be used by local authorities for the scientific control of air pollution.

Desire for M.A.C. Method

The view generally taken, both in Argentina and Brazil, was that factories etc. should be required to operate so as to keep the concentrations of pollution in the ambient air below certain limits of "maximum allowable concentration" (M.A.C.). This view was reflected in one of the recommendations of the Conference, which was that four named persons should comprise an Advisory Council who would recommend techniques along these lines and prescribe the appropriate values of M.A.C.

Methods based on M.A.C. are widely adopted for certain control purposes in the U.S.S.R. and associated countries and to a smaller extent in Germany, the U.K. and some other parts of Europe. From information gained during my visits to these countries and from certain published information there is no doubt that the chief value of M.A.C. is in the planning of new developments, particularly for the estimation on the basis of certain diffusion formulae and general experience, of suitable heights for chimneys and the distances which should separate large sources of pollution from resident populations. The use of M.A.C. methods in the control of pollution from existing installations involves a number of technological problems which have not yet been solved. For example, it is often difficult to determine what is the maximum concentration of pollution caused by any particular source because of: changes in wind direction and atmospheric turbulence (these may affect the results of measurements by a factor of up to 100 or more); difficulties in securing sites for instruments where they are needed, with electric power supply and freedom from molestation; where there is more than one source of a particular pollutant it is often difficult to determine the relative contributions of each. With ample time and resources, many of these difficulties can be overcome; under practical conditions of day-by-day control it would often be difficult to prove that a particular source was responsible for pollution exceeding the maximum allowable. In the U.K., the system of control is based on the requirement that factories etc. shall install and maintain the "best practicable means" of abating pollution; this method has been found reasonably effective and simple when operated by experienced inspectors using only limited laboratory facilities.

From my discussions it appeared that one of the main difficulties which South Americans envisaged, if the U.K. system were adopted in their countries, was the fear of dishonesty on the part of the inspectors. It seems to me, however, that this risk is no greater than with any other system and possibly less.

The lack, in South America, of information on developments in other parts of the world stems largely from insufficient access to the extensive scientific literature on this subject. Although I did not examine libraries, I obtained the impression that many of the important reference books and original publications were not readily available. If this is so, some means of building up these libraries is desirable. Books in English could be read in most of the centres I visited.

It also appears that few of the journals which publish current papers on air pollution are available in South America; I was told that this was partly due to restrictions in foreign currency. Arrangements for about half-a-dozen of the more important journals to be more widely available would be beneficial. There is also the difficulty, common in all countries, that there are so many journals publishing occasional but important papers on air pollution that nobody can read them all. This problem can best be dealt with by arranging for each centre of research to receive summaries of the world's current literature. Such summaries appear in the International Journal of Air and Water Pollution which should be among those received regularly. Other monthly summaries are available, including A.P.C.A. Abstracts (U.S.A.) and the Atmospheric Pollution Bulletin which is issued monthly by the Warren Spring Laboratory of the D.S.I.R. Stevenage, England (bona fide applications for free copies of the latter summary are sympathetically

Buenos Aires, Argentina. The General Paz Avenue, on the outskirts of the city

considered by the Director of the Laboratory). These abstracts would have the greatest value if arrangements were made for them to be translated into Portuguese and Spanish.

Obtaining information on current publications is only part of the problem for a relatively new entrant to this field; there is also the problem of obtaining and assimilating the relevant items of earlier published and unpublished experience. Personal contacts between the experts of different countries is likely to be the best means of meeting this need.

Air Pollution in Argentina

Whilst in Buenos Aires I was centered at the offices of C.I.P.U.E.C. (the branch of I.N.T.I. specially concerned with the efficient use of fuels) where Ing. del Carril, the President of I.N.T.I., and Ing. Basil Mason, Technical Adviser, and Ing. Henning, General Manager of C.I.P.U.E.C. gave me the benefits of their advice and made arrangements for most of my activities. Among the other people with whom discussions took place were representatives of the Municipality of B.A., the Province of B.A., the University, the Federal Ministry of Health, the National Metereological Service and the oil and gas industries.

Geographically and to some extent administratively, the country's air pollution problems can be divided into those of (1) the Municipality of B.A. (2) the industrial fringe of the city of B.A., which is part of the Province of B.A., and (3) other towns, which are becoming centres of industry, such as Rosario, Mendoza, Cordoba and Tucuman.

It is generally recognized that the most seriously polluted part of the country is the B.A. area. In other areas there are plants producing steel, non-ferrous metals, cement, fertilizers, chemicals, motor vehicles, petroleum and a wide variety of other products required by a modern community. It is reported that some of these plants are responsible for excessive air pollution but few details are available. Thus a nation-wide survey should be envisaged as soon as possible. Even if air pollution has not yet reached serious dimensions in these developing industrial areas, the present time may not be too soon to start thinking about controls—it is easier to prevent pollution at the planning stage than to cure it later.

The main air-pollution problems of Buenos Aires were as follows:

(*a*) *Domestic installations:* Estimates indicate that there are about 50,000 apartment houses and hotels equipped with oil-fired heating installations, many of which emit excessive smoke during part of the heating season. There is little regular servicing of these installations and it appears that many are in need of repair or adjustment. Lack of ordinary skill or care by operators may also be a factor. Ing. Mason envisages that a scheme for the compulsory servicing of these installations could be operated by C.I.P.U.E.C. Before such a scheme were adopted a pilot study would first be necessary to ascertain the magnitude of the operation and the kinds of repairs and adjustments needed. The part which the oil industry might play in such a project was discussed with a senior representative of one of the major oil companies; he felt that the industry could reasonably be asked to sponsor, or to help sponsor such a scheme and that if other companies were prepared to play their part, his would also.

(*b*) *Garbage disposal:* Pollution by odours, smoke ash etc. is caused by small domestic incinerators and large municipal destructors; garbage dumps on the outskirts of B.A. are also a cause of complaints. The low layer of haze which I saw covering large areas of B.A. on still evenings appeared to be due to the smoke from domestic incinerators.

The problem of preventing pollution from domestic incinerators has been tackled in other parts of the world and it has generally been found that the only real solution is to scrap them and to rely on large properly controlled municipal installations. However, in B.A. the municipal incinerators are located near residential areas and it is said that their performance leaves much to be desired. These nuisances could become intensified if the planned additional plants are installed to deal with the garbage now being dumped.

In so far as this problem is one of combustion efficiency and solids-arrestment, B.A. would appear to be fortunate in having available the specialized skills of the combustion engineers of C.I.P.U.E.C., although no co-operation between the Municipality and C.I.P.U.E.C. on this problem has yet occurred. To assist in the selection of a suitable site for new installations, taking into account the present and future urban developments, assistance would be obtainable from the Department of Architecture of the University of B.A., which is beginning to study the town-planning aspects of air pollution. The National Meteorological Service is also able and willing to co-operate in the work of the Clean Air Centre.

(*c*) *Power Stations:* The amount of black smoke which I saw discharged from the power station chimneys was excessive by any standards. Owing to the conspicuousness of such sources it is important that power stations should set a good example if any clean-air campaign is to receive general support. There is little doubt that the power-station engineers are technically qualified to do what is necessary to ensure more efficient combustion.

(*d*) *Motor vehicles:* Most of the buses, (including the "collectivos") in B.A. are powered by diesel engines and most of them discharge excessive amounts of black smoke; the result is a nuisance far greater than any I have seen in Europe. The nuisance is greatest in the narrower streets in B.A. where pedestrians may receive the full blast of the sideways-discharging exhaust pipes at short range.

Experience in other countries has shown that excessive smoke may be prevented by avoiding overloading, preventing the use of any rich-mixture control during driving and particularly by ensuring high standards of maintenance of the engine, fuel-pump and injectors. Although such maintenance presents no serious difficulty to large organizations, the necessary special skills and equipment are less likely to be available, or capable of being made available, in the many small workshops which service the vehicles of the various bus companies in B.A. The creation of a central organization for servicing the fuel-pumps and injectors should overcome much of this difficulty. It is possible that the Argentine motor industry would be able to

Rio de Janeiro, Brazil

provide this service; in any case the extensive experience of this problem which is available in the U.K. can be drawn upon.

Even the fumes from a well-maintained diesel have an unpleasant odour and need to be dispersed as rapidly as possible. This is a problem which has received a certain amount of investigation in London and elsewhere. The Clean Air Centre could usefully investigate the most suitable arrangement of exhaust pipes for use in B.A. but, of course, such improvements do nothing to reduce the need for smoke elimination.

A large proportion of the motor vehicles in B.A. are old and in a poor state of repair and in some taxis I detected the odours of exhaust gases. These vehicles may therefore involve drivers and passengers in the risk of the harmful effects of carbon monoxide; the main danger resulting from the inhalation of such gases is believed by some authorities to be the tendency for drivers to become accident-prone. A pilot survey of carbon monoxide, etc. inside cars and taxis and in the street-air, would be a simple and useful part of the Clean Air Centre's activities.

(*e*) *Industrial Plants:* Under present legislation the Municipality is empowered to require the abatement of any factory emissions which it considers harmful and it may, in the last resort, compel the factory to cease operations. The Municipality does not give advice on, or prior approval to, the modifications which may be needed to abate the nuisance; thus even factory managements who have tried to carry out their responsibilities in this matter, may still be served with a closure order. The Municipality also finds the present system unsatisfactory because of the difficulties of deciding when pollution from a particular source is harmful and of securing convictions in the courts. As previously mentioned, the officials with whom I discussed this subject were in favour of a system based on prescribed values of maximum allowable concentration, but my own view is that although such systems have important uses they are not necessarily practicable as a basis for the general control of air pollution. It is therefore suggested that before any firm decision is taken on new control legislation and techniques, there should be further investigations of the pros and cons of other methods. The U.K. could assist by providing documentary information based on her experience, followed up by further personal discussions between experts. This action would need to be taken soon.

Air Pollution in Sao Paulo and Rio de Janeiro, Brazil

My stay in these two cities totalled one week, during which I saw a few of the main sources of pollution and discussed current problems with representatives of C.I.C.P.A.A., S.U.R.S.A.N. and others; I also gave four lectures.

In both these cities the main problems are concerned with industrial emissions and the smoke from diesel buses. In Sao Paulo the industrial area is growing rapidly; according to some accounts the rate of this development is comparable with that anywhere else in the world. Within this area the various local authorities have considerable autonomy and inter-regional co-operation in the control of air pollution is restricted to the areas of Santo Andre and Sao Bernardo do Campo. These areas are co-operating with C.I.C.P.A.A. in the study of their air and water pollution problems with a view to the introduction of improved control measures. In these areas I visited several works where methods of reducing the emissions of harmful pollutants left much to be desired.

In Rio de Janeiro the growth of industry has been much less than in Sao Paulo but the factories which I saw were within the municipal area; the nuisances and possible health hazards of their emissions may therefore be more significant than if they occurred in a separate industrial area. Another factor which may increase the significance of these emissions in Rio is the frequent occurrence of periods of air stability which is characteristic of areas subject to "smog". I was shown photographs of the city covered by a layer of haze during one of these periods but the composition of the haze is not known.

In both Sao Paulo and Rio, as in Buenos Aires, the current opinion is that air pollution controls should be based on "maximum allowable concentrations". One suggestion under consideration is that the permissible limits of M.A.C. for ambient-air pollution should be fixed arbitrarily at one tenth of the concentrations commonly permitted in industrial premises. As in B.A., knowledge of U.K. methods of control was lacking but there was great interest in this subject; at two meetings with members of the Air Pollution Control Committee of C.I.C.P.A.A. and other interested parties I was cross-questioned and there were lively discussions on this subject. I am convinced that there is a very real desire in Brazil for more information on U.K. experience and techniques.

Some help in dealing with problems in Sao Paulo is being provided from the U.S.A. through the Pan-American Health Organization which is sponsoring a project under which the advice of its consultants and some scientific equipment is being made available.

In both Sao Paulo and Rio the excessively smoky diesel-buses pose the same problems as in Buenos Aires and the need for the same remedial measures is indicated. I understand that in Brazilia also, public transportation is by diesel buses; although these are not yet smoky, it is to be expected that as they become older and their engines worn, this dazzling city will also start to become smoke-begrimed.

Since, as in B.A., this nuisance is probably due to poor engine maintenance, particularly with respect to fuel-pumps and injectors, and since there is a modern motor industry centered at Sao Paulo, the solution of this problem on a nation-wide scale should not be too difficult. As already indicated, details of techniques which have been developed for dealing with this problem are available in the U.K.

NEW CLEAN AIR ACT

from Arthur C. Stern

U.S. Public Health Service

On December 17, 1963, President Lyndon B. Johnson signed into law the Clean Air Act which replaces previous Federal legislation in air pollution. The Bill (Public Law 88-206) greatly expands the role of the Federal Government in the field and is designed primarily to increase control efforts at the State and local levels.

Grants are authorized to air pollution control agencies in amounts not to exceed two-thirds the total cost of establishing, developing or improving abatement programmes. As an incentive for the multijurisdictional approach to pollution control, grants are authorized to intermunicipal or interstate agencies in amounts not to exceed three-fourths the total cost.

The Secretary of the U.S. Department of Health, Education, and Welfare is empowered to call a conference of control agencies in cases of interstate air pollution. He may do this either upon his own initiative or upon request by a concerned control agency. This conference procedure is designed to examine most closely the specific pollution problem in order to determine its nature, extent, and severity. Also, abatement proposals would be considered. After all the facts are in, the Secretary may recommend appropriate remedial action, allowing at least a six-month period for compliance. If, however, the Secretary should determine after the specified period that such remedial action has not been forthcoming, he may call a public hearing and make further recommendations to secure abatement of the pollution problem. Once again, a period of no less than six months would be allowed. If corrective action still is not taken, the Secretary may then request the United States Attorney General to bring suit to secure abatement action.

This procedure is followed in cases of intrastate air pollution, but there are two significant deviations: the Secretary can call a conference only upon the request of the governor, or local community with the governor's consent; and, the final enforcement procedures involving court action are reserved to the state.

The Clean Air Act also requires the Secretary to form a "technical committee" which would meet to evaluate progress, or the lack of it, in the development of devices and fuels to abate pollution from motor vehicles. This committee would also recommend and implement programmes of research which could lead to the development of these devices and fuels. Incidentally, the Secretary must report to the Congress within one year, and semi-annually thereafter, on actual measures, if any, taken to abate motor vehicle pollution. He may also recommend additional legislation to curb this type of air contamination.

An interesting feature of this Bill requires Federal departments and agencies to co-operate with the Secretary or any pollution control agency in preventing and abating emissions from buildings, installations, or other properties under their jurisdiction.

Other provisions of the Clean Air Act include: an expanded national research and development programme; the compilation and publication of air pollution criteria to serve as guidelines for control agencies desirous of setting emission limitations and ambient air quality standards; and, a research programme to develop improved techniques for extracting sulphur from fuels.

The Bill authorizes appropriations of $95 million over the next three years.

AMERICAN WHITE PAPER

A "white paper" on air pollution is being prepared by a sub-group of the American Association for the Advancement of Science Committee on Science in the Promotion of Human Welfare. It will probably be published this summer.

The white paper is designed to present facts concerning contaminated air which can be fully substantiated. According to James P. Dixon, Jr., president of Antioch College, Ohio, and chairman of the group preparing the document, a purpose of the project is "to write a primer" to be used by scientists of all disciplines in forming their own opinions and guiding opinion in their respective communities. The document will also contain a section suggesting policy for meeting the dangers of air pollution.

The white paper will represent more than a year's work and is the culmination of a pilot programme in scientific guidance of the public. It came about because some scientists here were concerned with their failure to influence public opinion on critical scientific issues. The white paper marks a new approach to make their professional evaluations count.

Californian Fuel Oil Ban

In January the Los Angeles, California, County Board of Supervisors imposed a year-round ban on the industrial and commercial use of fuel oil except when natural gas is not available. Since March, 1961, the ban had been in effect only during the seven heaviest smog months, from April 15 to November 15. The rule was actually begun in 1958 as a six-month ban.

The prohibition will affect about 1,000 of the county's estimated 30,000 industrial plants and commercial operations, since the remainder are already full-time gas users. However, the 1,000 concerns include most large industrial operations, oil refineries and power plants. The ban does not apply to fuel oil containing less than 0·5 per cent of sulphur by weight.

South Africa

CONFERENCE AT JOHANNESBURG

The third Annual Conference of Contributors to the Air Pollution Research Fund took place in Johannesburg on November 28, 1963 and was attended by delegates from 23 industrial undertakings, 17 local authorities and the Council for Scientific and Industrial Research (C.S.I.R.), all of whom are collaborating in the national research effort on air pollution. The Conference was convened for the purpose of reporting to contributing bodies on the progress made on various air pollution research projects being undertaken by the C.S.I.R's Air Pollution Research Group and other organizations.

Diesel Smoke

The Conference was presented with a diesel smoke memorandum which had been drawn up by a sub-committee appointed by the C.S.I.R. Air Pollution Research Group's Technical Advisory Committee and was still under consideration by the South African Road Safety Council. The main conclusion drawn in the memorandum was that excessively dense diesel exhaust smoke posed a traffic hazard rather than a danger to public health. Among references made to views held in overseas countries as a result of investigations by responsible bodies, was one to the National Society for Clean Air. The committee considered that black smoke was avoidable but although education of the diesel owner was necessary, legal measures were needed to implement successful control. The following factors were named as being desirable for incorporation into road traffic regulations:

1. The establishment of a legal standard for maximum allowable smoke blackness.
2. The specification of means (an instrument) for the testing of a suspect vehicle's smoke emission and for its comparison with the standard.
3. The power to stop vehicles on the road on suspicion of excessive smoking or overloading and for suspension of licence when necessary.
4. A method by which the maximum load (horsepower) of a diesel engine and the maximum gross weight of a vehicle will be determined with reference to the maximum *smoke-free* engine power.
5. The sealing of adjustments to critical fuel-injection components and a requirement that readjust- be made only by authorized mechanics, registered for this purpose; the specification of technical standards to which readjustment and calibration must be effected.
6. The testing and certification of the smoke-measuring apparatus by a recognized national body.
7. Legal penalties for failure to comply with control provisions.

After considering the requirements desired in legal control and the shortcomings of existing legislation, the committee put forward suitable recommendations.

Air Movement Studies

Dr. Etel Kemeny reported on a new research project by the Air Pollution Research Group of the C.S.I.R., the aim of which was to find the reason for the extraordinary accumulation of atmospheric pollutants that sometimes took place during the winter over Durban Bay Area, and which was referred to as the "Durban smaze" by the inhabitants. Dr. Kemeny outlined the part which meteorology generally played in air pollution problems and described the measurements of various meteorological factors in Durban during the winter of 1962. Among the results shown it was found that the frequency of inversion conditions for May, June and July was 40–50 per cent and that such conditions existed up to 4 hours after sunrise, being most marked in the first 50 feet above the ground. The inversions were found to be related to the occurrence of a flow of cold air down the Umgeni and Umbilo rivers and the diversion of these air streams into Durban. In view of the smoke pollution and these inversions, a good possibility existed that smog conditions would be repeated in the city during other winters.

Report from Municipalities

A combined report on the activities of the municipalities of Johannesburg, Germiston, Durban, Cape Town and Pietermaritzburg was presented to the conference by Councillor A. B. Widman, Chairman of the Johannesburg Clean Air Consultative Committee. These five local authorities are all concerned about air pollution and have been taking measurements of smoke and sulphur dioxide density in their areas. As far as air pollution control is concerned however, the city councils seem to be hampered by lack of adequate legislation. Durban is an exception in being the only authority with smokeless zone legislation, and having now three residential zones in operation. The reduction of industrial smoke emission has continued satisfactorily on the whole in Durban and the campaign against vehicles emitting excessive smoke has been stepped up with the aid of a diesel smoke meter. Johannesburg's programme of air pollution control has entered its third year with no legislation to enforce it yet. The newly formed Clean Air Consultative Committee has appointed an Action Committee to investigate regulations to be made under forthcoming legislation, publicity, solid smokeless fuels manufacture, vehicle smoke control and the training of boiler operators and supervisors.

Reports on Research Projects

Dr. E. C. Halliday gave a report on the activities during the preceding year of the Air Pollution Group of which he is head. These included a study of pollutants in city air undertaken by Mr. C. W. Louw who has also been developing a method for determining concentrations of benzpyrene. Other activities were: the investigation of designs of low-cost efficient cookers for Bantu housing which would burn smokeless fuels; analyzing and compiling the results of air pollution measurements made by South African cities; determining the efficiency of a cross-tube vertical boiler, using both bituminous coal and anthracite in turn.

Mr. C. G. Bruckmann, Head of the C.S.I.R. Chemical Engineering Research Group addressed the conference on services available to industries and others in investigating how the emission of chemical substances into the atmosphere might be controlled.

The closing address of the conference was Dr. Halliday's report of his recent air pollution study tour through the United States, Britain and Western Europe, during which he was able to compare progress since 1956 when he had undertaken a similar tour. While in England he attended the Scarborough conference of the National Society for Clean Air.

France

THE A.P.P.A. JOURNAL

We have received the October-December 1963, issue of the French journal *Révue de la Pollution Atmosphérique* published by the A.P.P.A. Its main feature is the account by M. M. Fournier of the third (1962–63) campaign by the Seine Préfecture against atmospheric pollution in Paris from domestic sources. An article by Professor Spurny of Prague deals with the use of "millipore" filters in capturing very fine aerosol samples in air pollution studies, and Professor G. Blancher writes about the importance of preserving green spaces in urban developments. A section of the journal is devoted to reports on activities of local air pollution committees, conferences that have taken place in France and abroad (including a report of the Scarborough conference, 1963), and an account of new legislation and regulations on smoke from vehicle exhausts. Finally, there are 41 pages of air pollution literature abstracts.

Heating Britain's Glasshouses.—In this new National Coal Board publication reference is made in the foreword to the alternatives that face our horticultural industry—to cling tenuously to traditional and often outmoded practices, or reach boldly towards new concepts, if the hardening Continental opposition is to be met and the consumer demand for higher standards satisfied.

The majority of Britain's growers choose coal and a footnote explains that the term coal includes such solid fuels as anthracite, coke and numerous manufactured smokeless fuels when used in the booklet.

In a section dealing with the Clean Air Act efficient combustion is referred to as the key to successful and economical heat generation and the reader is reminded that the Act authorizes the progressive introduction of smoke control areas "with even more stringent regulations". Growers are reminded that an area not already designated a smoke control area maybe scheduled to become one.

The virtues of mechanical firing in greenhouses are emphasized and it is pointed out that mechanical stokers burn bituminous coal smokelessly without excessive SO_2 emissions—emissions, which, concentrated at ground level, can ruin crops overnight. Effective colour diagrams and black and white photos illustrate the variety of stoking and firing methods which can be used in the industry.

The booklet gives tabulated information about solid smokeless fuel and explains the technical service available to growers. It can be obtained on request from: Marketing Department, National Coal Board, Hobart House, Grosvenor Place, London, S.W.1.

THE 1964 ANNUAL CONFERENCE

The Society's annual conference and exhibition will be held at Harrogate from Tuesday, October 20 to Friday, October 23. Emphasis will naturally be placed on discussing aspects of the domestic smoke control situation, and one session will be of exceptional importance. It will include addresses on their respective contributions to the future of smoke control by Sir Henry Jones, Chairman of the Gas Council, Mr. C. T. Melling, Deputy Chairman of the Central Electricity Generating Board, Mr. F. Wilkinson, Director for Marketing, National Coal Board, and Mr. E. Rendall, General Manager, Industrial Sales, Shell Mex and B.P. Ltd. There will also be a session on regional reports on the smoke control situation, for which the Society's Divisions are being asked to nominate speakers. Another session will discuss the broader aspects of trends in domestic heating.

Dr. J. S. Carter, the well-known and well-liked Chief Alkali Inspector is to give a Des Voeux Memorial Lecture, on the hundred years of air pollution control in this country that is marked by the centenary of the Alkali Acts. Dr. Carter is due to retire before the end of the year, and the lecture will be his last official activity.

The final session of the conference will include the presentation of the report being prepared by the Technical Committee on the ways and means for reducing sulphur oxides emissions; and, it is hoped, a paper on progress being made with the prevention of smoke and fumes from diesel engine vehicles.

Works visits and a film show are also being arranged, and there will again be a feature of special interest for the ladies, as well as the usual social occasions.

The Clean Air Exhibition promises well, with excellent support already certain from former exhibitors and from new ones.

The official invitations to appoint delegates will be sent out in May, immediately after the municipal elections.

Clean Air and Refuse Collection

Memorandum from the Society

The Ministry of Housing and Local Government has set up a Working Party to "examine the facts of refuse collection; to what extent it is unsatisfactory, what the difficulties are, and which methods are proving most successful; and to consider what advice can be given to local authorities on how to obtain the best results".

Because of the bearing this subject has on clean air it has been examined by the Parliamentary and Local Government Committee and Executive Council, and the following memorandum has been submitted to the Working Party:

Introduction

The National Society for Clean Air is committed to the pursuit of every opportunity to reduce or remove pollution from the atmosphere and welcomes the opportunity of discussing the contribution which a comprehensive refuse collection service can make to furthering this aim.

Clean Air Act

Local authorities are given powers under the Clean Air Act, 1956, to deal with emissions of smoke and to an extent, of grit and dust, from the chimneys of dwellings and commercial and industrial plant. Powers are also available to deal with colliery spoilbanks, railway engines and vessels. In all these cases failure to prevent or to minimize smoke emission is an offence, there is no need to prove nuisance. In the case of smoke arising generally, other than from a chimney, it is necessary to be able to prove that a nuisance is committed in order to bring the emission of smoke within the scope of the Clean Air Act.

Need to Eliminate Burning of Refuse

The Society maintains that it is most important in the interests of clean air to reduce in whatever ways are possible the number of points at which the combustion of refuse takes place, and at which smoke, grit and dust can be produced, and that to eliminate the need for refuse of any type to be burned, either in incinerators or in the open, would be a most desirable objective.

Collection Service

General

The *scope* of a municipal collection service has a very direct bearing on atmospheric pollution, because if it is too narrowly limited, much of the refuse which is excluded (*e.g.* trade refuse, old furniture, garden refuse, etc.), would be burnt either in the open air or in primitive and inefficient incinerators. Local authorities could not effectively stop this form of atmospheric pollution because it would occur at irregular intervals, in unexpected places, and would be over by the time an inspector arrived. In some cases the burning would take place at night when smoke discharge would be invisible. If, by special effort, a local authority did succeed in curbing such inefficient incineration, there would certainly be a corresponding increase in the unauthorised dumping of rubbish in secluded places.

Domestic Refuse

(*a*) Local authorities should be under a clear legal obligation to remove all refuse and rubbish from dwelling-houses—including worn-out furniture, wall papers stripped by do-it-yourself householders, etc.

(*b*) Garden refuse presents a more complex problem, because of wide variations in circumstances. Some town houses and flats have gardens so small that there is no space for satisfactory composting or incineration. In such cases, the small amount of rubbish can probably be accommodated in the dustbin, and that should be permitted as the most satisfactory solution. In larger gardens, all green refuse should be composted. Householders who prefer to have substantial quantities of garden refuse removed, instead of composting or burning it, should be able to have it removed by the Corporation on payment of reasonable costs.

Trade Refuse

(*a*) Local authorities should collect commercial and industrial refuse on request or accept it when delivered to such disposal point as they may direct. Certain safeguards would be necessary, just as they are necessary with regard to drainage from trade premises, and no local authority should be obliged to accept dangerous, toxic or specially difficult types of trade refuse.

(*b*) Traders who prefer to install their own incineration plant, subject to the control of Section 3 of the Clean Air Act, should be allowed to do so. Small, improvised, types of incinerator are seldom satisfactory and should not be encouraged merely because they ease the strain on the authority's cleansing department. Local authorities need not be afraid of extending their existing service because reasonable costs can be recovered from the traders.

Refuse Disposal

From the clean air point of view the Society considers it highly desirable that *disposal* of refuse should be considered by a further Working Party. It is our view that local authorities should be required to take all reasonable precautions to prevent atmospheric pollution and methods of disposal should be so designed and operated as to prevent the emission of smoke and dust. The Ministry of Housing and Local Government should investigate any complaints concerning nuisances from local authority refuse disposal arrangements.

Charity's Move Praised

The Chipping Barnet Poor Allotments Charity is 150 years old, but its trustees have moved with the times. Set up to provide coal for the needy, the charity has been adapted to pay for gas and electricity in what is now a smokeless zone. This move has brought congratulations in the report for 1962 of the Charity Commissioners for England and Wales, in which the alteration is reported.

The Strasbourg Conference

The date of the air pollution conference being organized by the Council of Europe, which is to be held in Strasbourg, has been altered since our last report, and will now be from Wednesday June 24 to Wednesday, July 1, 1964. There will be seven full days, with morning and afternoon sessions each day, and a break only on the Sunday. It thus seems that in the field of air pollution the conference will break all records in both duration and the weight of the agenda.

The 14 Working Parties have been busily engaged in preparing the reports that are to be presented and discussed. Each Working Party consists of rapporteurs from the participating countries, which are:

> Belgium, Denmark, France, West Germany, Ireland, Italy, Luxembourg, the Netherlands, Norway, Sweden, Turkey, and the United Kingdom.

There will also be some American delegates to report on various aspects of work and progress in the U.S.A.

The opening session will include an inaugural speech by a United Kingdom Minister, not so far named (an acknowledgment of the pioneer work of this country) and an introductory statement by a representative of the World Health Organization. The conference will then get down to the consideration of the reports of the 14 groups. The day by day programmes, in brief, are as follows:

> *Wednesday, June 24*—Effects of pollution on human health; effects on animals and plants.
>
> *Thursday, June 25*—Economic effects; danger thresholds; terminology and units of measure; standardization of measuring and control apparatus and methods of measuring; meteorological, topographical and geographical factors influencing air pollution.
>
> *Friday, June 26*—Methods of reducing pollution caused by combustion domestic (and industrial); methods of reducing pollution caused by internal combustion engines (motor vehicles).
>
> *Saturday, June 27*—Methods of reducing pollution caused by specific industries: ferrous metals, non-ferrous metals, cement works, coke plants and gas works, oil industry, chemical industries, and other industrial activities.
>
> *Monday, June 29*—Town and country planning; organization or development of European co-operation in research, standardization and documentation concerning the campaign against air pollution.
>
> *Tuesday, June 30*—Methods of informing and educating the public on the different ways of combating air pollution; comparison of national laws and regulations: possibility of standardizing these and drawing up technical agreements and European conventions on air pollution; discussion of motions for resolution or recommendations of the conference.
>
> *Wednesday, July 1*—Resumed discussion of motions, etc.; presentation of general conclusion speaker to be named; final address by M. Louis Armand.

Participation

It should be pointed out that the conference is of a restricted character, and the participants will be the representatives and rapporteurs nominated by the co-operating Governments, all of whom are members of the Council of Europe. It does not therefore directly include representatives of, for example, technical or medical organizations, or of the local authorities. The meetings will be held in the Council chamber in the House of Europe, and it will be possible for non-participants or observers to obtain seats in the public galleries.

The information department of the Council is planning a full publicity programme prior to, and of course during, the conference. It is hoped that the British press will be interested and give good cover to this special event. A full report will be published by the Council, probably next year.

Fume Arrestment in Steelmaking Processes

London Conference

T. Henry Turner, M.Sc., M.I. Mech.E., M.I. Loco.E., F.I.M.*

STEEL is indispensable. Steel ploughs, tins, trains, refrigerators, cookers and knives serve our food. Steel razors and toys, pipelines and ships, weapons of war or prison bars regulate our lives. Steel is made from dusty minerals, smelted in blast furnaces, melted in steel furnaces, rolled and forged in grimy, noisy places that make poor residential neighbourhoods. For centuries this essential industry was associated with dust and dirt, smoke, steam and fumes that seemed inevitable.

But surprising things have been happening under the spurs of good neighbourliness, fuel economy, and Clean Air legislation. Old established steel works, where the writer walked as as a boy in inches deep black millscale dust, now have clean swept concrete floors. The tall, begrimed works chimney stacks no longer blacken the neighbourhood with their tarry smoke and electrification of the works has greatly reduced their fuel costs. The widely heard, frighteningly noisy, steam hammers have been replaced by more powerful, easier controlled electric-hydraulic presses that are almost soundless. Their smoky coal-fired heat treatment furnaces have been replaced by electrically heated, smokeless ones. The interior walls of the old works have been cheerfully painted and the workpeople, who formerly could not help being grimy, now appear able to keep clean at their work.

Nevertheless while many far-sighted managements struggled to introduce these and other such beneficial changes, bold experimenters were seeking to improve steel furnace output, control, and ability by the introduction of the now available tonnage oxygen by lancing it through pipes into or above the molten metal. During the past decade this amazing technical achievement has come into world-wide use. With it came a new, world-wide form of atmospheric pollution from fumes of iron oxide that are not toxic but are an undesired dirty nuisance.

Consequently many members of the National Society for Clean Air will be interested in Special Report No. 83, of the Iron and Steel Institute, when it is published in 1964, giving the full official report of the papers and discussions of their Fume Arrestment Conference that the writer attended and comments upon here as follows.

The two-day Conference on Fume Arrestment in Steelmaking Processes was held in the Hoare Memorial Hall, the room in Church House, Westminster, where the Commons met after they were bombed out of the Houses of Parliament. Metallurgists and engineers filled the hall and part of the gallery for all the sessions, which shows how seriously the steel industry is concerned with overcoming this problem.

Before the four sessions got down to consideration of the fourteen preprinted papers the President of the Iron and Steel Institute invited the Chief Alkali Inspector of the Ministry of Housing and Local Government, to address the Conference. In doing so Doctor J. S. Carter, C.B.E., F.R.I.C., referred to the helpful co-operation that he and his inspectors had experienced in dealing with the technically difficult problems encountered in various branches of the Iron and Steel Industry. A little earlier in 1963 the Government had commemorated the first Alkali Act's centenary by a Reception at Lancaster House but it was in the relatively short period since 1958 that the greatest progress towards clean air had been achieved. Even though there remain difficult questions, some of which are hard to answer, we have gone slowly a long way.

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* Deputy Chairman, NSCA Executive Council.

Then, to the obvious pleasure of Mr. F. B. George, President of the Iron and Steel Institute and of many members, Dr. Carter said that he was there to thank the Iron and Steel Industry from the bottom of his heart for their real co-operation in overcoming both air and water pollutions, and for their trouble-taking endeavours to be a good neighbour. His deputy chief alkali inspector, Doctor E. A. J. Mahler, F.R.I.C., was also present and took part in the subsequent discussions.

In view of the present sense of urgency to implement the Clean Air Act, and of the great sums of money being spent by the iron and steel industry in willingly playing their part, and paying their part, in the international movement towards clean air, the four sessions of this conference were timely and usefully informative. The presence of the Alkali Inspectors as welcome visitors underlined from the start of the conference that clean air concerns the nation as well as the industry.

Dr. Mahler said that he wished the industry could make a greater effort of publicity to show what it had done and was doing in combating air pollution. He took special interest in this matter because the Clean Air Act had little to do with the technical aspects of many air pollution problems that are peculiar to the Iron and Steel Industry, and it was arranged that these were dealt with under the Alkali Act. However, it seems that a steel works manager may find that other of his air pollution problems may come under the Local Authorities through the Clean Air Act, or under requirements of the Factory Act. In some cases the same metallurgical process may come under the local Public Health Authorities, when conducted in relatively small furnaces, and under the Alkali Inspectorate when conducted in large furnaces. One speaker in the discussion said that in Sheffield the borderline of responsibility for electric arc furnaces came at 30 tons capacity; those above that figure coming under the Alkali Inspector.

Fume Arrestment

The scope of this conference was carefully limited by the choice of the two words "Fume" and "Arrestment" for use in its title. It dealt in practical detail with the seizure and retention of particles of iron oxide that would otherwise form objectionable dense brown clouds when steelmaking processes employed oxygen lancing. There are of course many other pollution problems in the industry and these have been discussed; for example see:

1. "Air and Water Pollution in the Iron and Steel Industry" Iron and Steel Institute's Special Report No. 61, 1958.
2. "Air Pollution in the Iron and Steel Industry" Organisation for Economic Co-operation and Development's Report, 1962.
3. "Some Aspects of Air Pollution Control in the Steel Industry" etc. National Society for Clean Air's Proceedings of the Harrogate Conference, 1962, pp. 12-43.

In this further conference, November 26-27, 1963 at Church House, the papers were divided into sessions thus: 1. "General Principles of Fume Arrestment." 2. "Operating Experience in Open-Hearth Steelmaking." 3. "Operating Experience in Basic Oxygen Steelmaking." 4. "Operating Experience in Electric Arc Furnaces". Abstracts of the fourteen papers that were read and discussed during these four sessions may be found at the end of this issue of SMOKELESS AIR under the usual heading of "Air Pollution Abstracts" so details of them will not be given here.

The essentials of gas cleaning theory are set out in quite a comprehensive manner in the 23 quarto pages of the first paper. It should help many plant engineers to discriminate between the claims of competing manufacturers of inertial separators, impingement separators, or electrostatic precipitators.

Toxicity

The fumes from almost all of the steelworks processes are more of a nuisance than a danger but the "Ledloy" process, in which the metal lead is added to steel as the latter is poured from ladle to ingot mould, is unusual in that it produces lead oxide fume that must be prevented from escaping into the atmosphere, inside or outside the workshop, because it is toxic, and not simply because of its nuisance value.

This toxic lead oxide fume is produced in large quantities at the point of lead addition and continues to rise from the moulds until the metal freezes. The stream of lead must be clearly seen by the lead addition lance operator, so shallow box-type hoods are used, arranged to rest on the moulds, and high air velocities are needed to prevent fume from being convected into the shop atmosphere, and volumes of the order of 20,000 ft.^{3}/min. are common.

New Developments

It was the LD converter process that first raised this iron oxide fume cloud to serious dimensions. Now abandoning the usual methods for ducting and cleaning waste gases from top-blown converters some have explored a new way; that of recovering carbon monoxide of high calorific value, while at the same time much lessening the volume of gas to be treated.

Many new electric arc steelmaking furnaces are being installed. It is therefore welcome that the control of fume from steel melting arc furnaces has been much aided by the development of direct fume extraction and collection. At one stage during tests to find the best kind of air curtain and hood "the melters spat white and every one else round the works spat brown" was one comment from the platform, and another "We want the best fume arrestment and we know that we will have to pay for it". Such a desire and such preparedness go far to ensure that there will be the desired beneficial progress in the spirit of the Clean Air Act.

Personal Co-operation

During the first session the President asked Mr. J. A. Kilby, M.I.MECH.E., director and chief mechanical engineer of Colvilles Ltd., to preside over the discussion but showed his close interest by remaining beside him on the platform. Mr. Kilby recently succeeded Mr. George as Chairman of the Engineering Committee of the Iron and Steel Institute, which organizes the Iron and Steel Engineers' Group activities, of which this conference was a fine example.

For the two sessions of the second day the Chair was taken by Mr. R. A. Hacking, O.B.E., M.SC., F.I.M., who is well known to many members of our Society. He gave a paper on this subject to a meeting in Nottingham that was organized by our Society and was Chairman for the Technical Session at Harrogate in 1962, and is moreover the representative on our Council of the British Iron and Steel Federation. The Clean Air Year Book shows how that body has backed its goodwill with substantial subscriptions to help the work of our Society. Many of our members have helped the Iron and Steel Industry and this two-way co-operation has already borne fruit in considerable cleaning up of works and their surrounding atmospheres, even if much remains to be done.

It is good that steelworks control panels and mechanical handling methods have made possible working conditions that are often vastly better than those which previously existed.

SMOKE CONTROL AREAS

Progress Report

POSITION TO JANUARY 1, 1964—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation	44	1
Acres, 3,400		
Premises, 41,060		
Smoke Control Areas in Operation	1,281	37
Acres	285,365	19,964
Premises	1,509,048	87,933
Smoke Control Orders		
Confirmed	177	10
Submitted	135	7
Grand Totals	1,637	55

The lists below are supplementary to the information in the last issue of Smokeless Air (Winter, 1963), which gave the position up to October 1, 1963. They now show the changes and additions to January 1, 1964.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

The list of new areas in operation of smoke control is based on the plans originally submitted to the Ministry of Housing and may erroneously include some local authorities who have made postponements without notifying the Ministry of the fact.

ENGLAND AND WALES

New Smoke Control Areas in Operation

Acton B. Nos. 6 and 7, Aylesbury B. No. 1, Barking B. Nos. 4 and 5, *Bebington B. No. 8, Bethnal Green M.B. No. 5, Birmingham C.B. Nos. 10, 63, 89 to 94, Blaby R.D. No. 2, Blackburn C.B. No. 3, Bolton C.B. No. 20, Bootle C.B. No. 5, Brighouse B. No. 8, Bromley B. No. 5, Cheadle & Gatley U.D. No. 5, Chingford B. No. 3, Croydon C.B. No. 5, Dagenham B. No. 4, Derby C.B. No. 4, Ealing B. No. 13, Elland U.D. Nos. 1 to 3, Ellesmere Port B. No. 5, Enfield B. No. 4, Eston U.D. No. 1, Failsworth U.D. No. 3, Hackney M.B. No. 6, Halesowen B. Nos. 4 and 19, Halifax C.B. No. 7, *Harlow U.D. No. 2, Harlow U.D. No. 3, Harrow B. No. 6, Heywood B. No. 4, Hindley U.D. No. 2, Hornsey B. No. 5, Islington M.B. Nos. 11 and 12, Mansfield B. No. 3, Middleton B. No. 9, Mitcham B. No. 1, Morley B. Nos. 22 to 24, Newcastle-under-Lyme B. No. 3, Newcastle-upon-Tyne C.B. No. 8, Newton-le-Willows U.D. Nos. 1 and 2, Nottingham C.B. No. 4, Nuneaton B. No. 8, Oldham C.B. No. 5, Ossett, B. No. 5, *Paddington M.B. No. 4, Padiham U.D. Nos. 5 and 6, Prescot U.D. No. 2, Prestwich B. Nos. 6 and 6B, Radcliffe B. No. 3, Reading C.B. No. 8, Rochdale C.B. No. 5, Romford B. Nos. 1 and 2, Rotherham C.B. No. 13, Salford C.B. No. 9, Sheffield C.B. No. 10, Shoreditch M.B. No. 5, Slough B. No. 5, Stockport C.B. No. 5, Stoke-on-Trent C.B. No. 11, Stretford B. No. 4, Swinton & Pendlebury B. No. 3, Tottenham B. No. 4, Wakefield C.B. No. 6, Watford B. No. 3, Wednesfield U.D. No. 5, *West Hartlepool C.B. No. 1, Westminster M.B. Nos. 10 to 13, Widnes B. No. 3, Wigan C.B. No. 3, Willesden B. No. 5, *Wimbledon B. No. 1, Yiewsley & West Drayton U.D. No. 4.

New Orders Confirmed but not yet in Operation

Barking B. No. 6, Barnes B. No. 4,

Beddington & Wallington B. No. 4, Birmingham C.B. Nos. 95 to 101, Blackburn R.D. No. 1, Chesterfield R.D. No. 4, Dagenham B. No. 6, Dartford B. Nos. 5 and 6, Dudley B. No. 6, Feltham U.D. No. 4, Finchley B. No. 9, Fulham M.B. No. 8, Hampstead M.B. No. 6, Harrow B. No. 7, Heckmondwike U.D. No. 4, Hendon B. No. 9, Keighley B. No. 4, Kensington M.B. No. 7, Kidsgrove U.D. Nos. 1 to 7, Kingston-upon-Thames B. No. 4, Leeds C.B. Nos. 38 and 39, Leicester C.B. No. 11, Lewisham M.B. Nos. 14 to 17, Leyton B, No. 4, Malden & Coombe B. No. 5, Manchester C.B. No. 10, Merton and Morden U.D. No. 5, Ossett B. No. 9, Richmond (Surrey) B. No. 5, Rothwell U.D. No. 6, St. Marylebone M.B. No. 7, Sheffield C.B. No. 15, Shoreditch M.B. No. 6, Slough B. No. 6, Southgate B. No. 4, Spenborough B. No. 5, Stoke-on-Trent C.B. No. 13, Sutton Coldfield B. No. 2, *Walsall C.B. No. 7, Walsall C.B. No. 8, *Walthamstow B. No. 8, Wanstead & Woodford B. No. 5, Wembley B. No. 9, Wimbledon B. No. 3, Wolverhampton C.B. No. 6, Wood Green B. No. 6, Woolwich M.B. No. 19.

New Orders Submitted for Confirmation but not yet Confirmed

Acton B. Nos. 8 and 9, Aireborough U.D. Nos. 14 and 15, Baildon U.D. No. 1, Barking B. No. 7, Barnes B. No. 5, Barnet U.D. No. 5, Bermondesey M.B. No. 6, Bingley U.D. Nos. 10 and 11, Camberwell B. No. 6, Crawley U.D. No. 5, Croydon C.B. No. 6, Darlaston U.D. No. 1, Ealing B. Nos. 16 and 17, East Barnet U.D. No. 5, Friern Barnet U.D. Nos. 5 and 6, Grantham B. No. 8, Hackney M.B. No. 8, Halesowen B. Nos. 22 and 23, Harlow U.D. No. 4, Hayes & Harlington U.D. No. 23, Heston & Isleworth B. No. 8, High Wycombe B. No. 12, Hornchurch U.D. No. 6, Hornsey B. No. 6, Ilkeston B. No. 1, Islington M.B. Nos. 13 and 14, Jarrow B. No. 2, Kearsley U.D. No. 1, Knottingley U.D. Nos. 5 and 6, Lambeth M.B. Nos. 9 to 11, Lancaster B. Nos. 2 and 3, Leeds C.B. Nos. 40 and 41, Leicester C.B. Nos. 12 and 13, Mitcham B. No. 2, Old Fletton U.D. Nos. 4 and 5, Peterborough B. No. 1, Potters Bar U.D. No. 1, Preston C.B. No. 8, Queensbury & Shelf U.D. No. 3, Radcliffe B. No. 4, Reading C.B. No. 9, Sheffield C.B. No. 11, Shipley U.D. No. 3, Southwark M.B. No. 3, Stockport C.B. No. 7, Stoke-on-Trent C.B. No. 14, Stretford B. No. 5, Sutton & Cheam B. Nos. 1 and 2, Walsall C.B. No. 26, Westminster M.B. Nos. 14 and 15, Whitefield U.D. No. 6, Willesden B. No. 6 Wortley R.D. Nos. 5 and 6.

SCOTLAND

New Smoke Control Orders in Operation

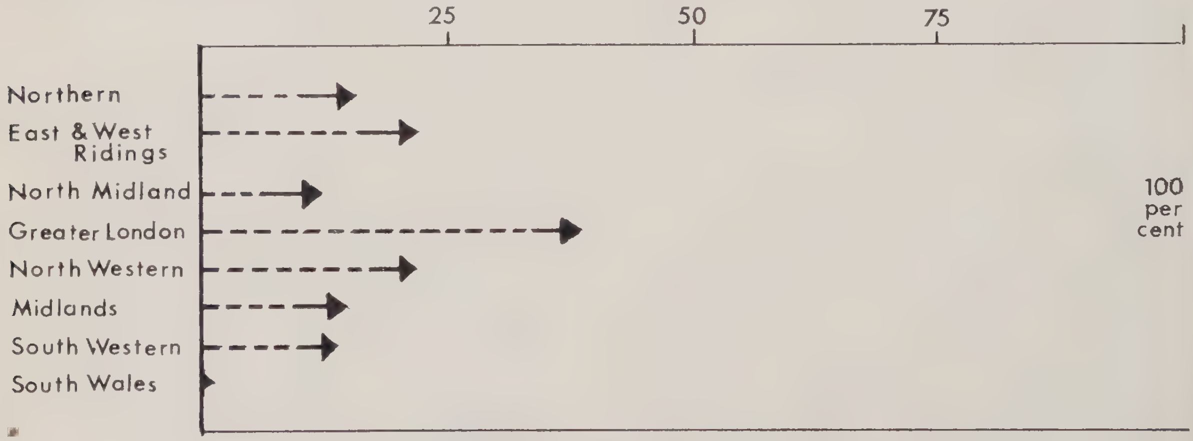
Edinburgh (Corstophine No. 1.)

New Smoke Control Orders Confirmed but not yet in Operation

Barrhead No. 1 (Arthurlee), Dundee (Downfield West), Edinburgh (Corstophine No. 2), Edinburgh (Corstophine No. 3), Glasgow (Shettlesten & Tollcross), Falkirk No. 3.

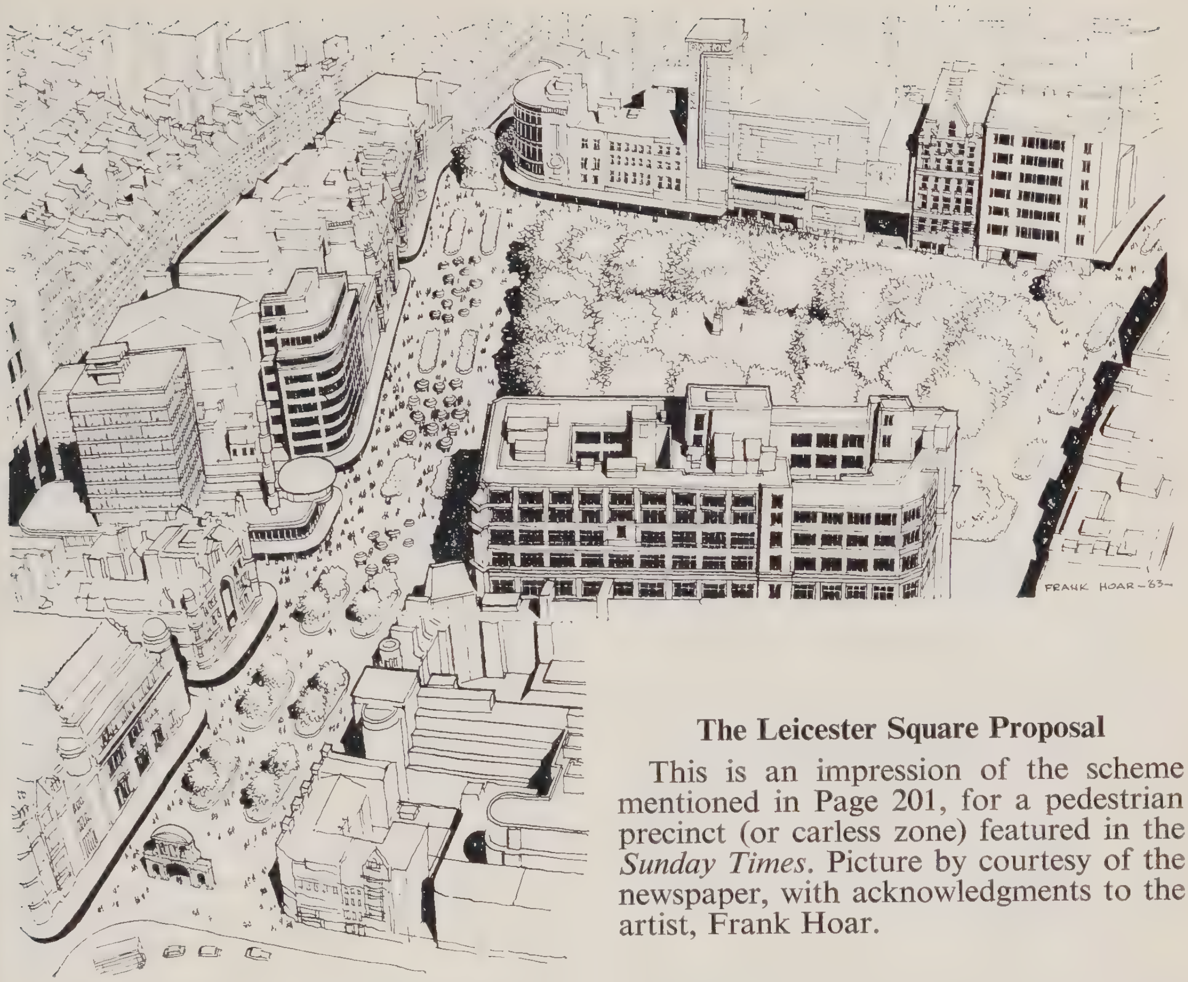
New Smoke Control Orders Submitted for Confirmation but yet not Confirmed.

Clydebank No. 4 (Faifley), Edinburgh (Corstophine No. 4), Motherwell & Wishaw (English St.), Stirling County (Stenhousemuir No. 2).



Regional Progress in Smoke Control

The diagram shows the relative progress made in the different regions for the year ended December 31, 1963, in terms of the percentage of premises in smoke control areas measured against the final target figure. Full details will be given in a table in the forthcoming *Clean Air Year Book for 1964-65*.



The Leicester Square Proposal

This is an impression of the scheme mentioned in Page 201, for a pedestrian precinct (or carless zone) featured in the *Sunday Times*. Picture by courtesy of the newspaper, with acknowledgments to the artist, Frank Hoar.

Reducing Sulphur in Fuel

Electrical Times (January 2, 1964) reports on a new research programme in progress in the United States into ways of removing sulphur from coal before it is burnt in power stations. There is also a programme aimed at reducing sulphur pollution by removal from flue gases.

It was realized that present knowledge of coal cleaning did not offer much promise of reducing sulphur content below that obtainable by conventional methods, by new and economic processes. However, a preliminary study suggested pulverization, to liberate the pyrites, followed by mechanical or electrical removal was worthy of investigation. A pilot pulverizing plant is working with a 250 lb./hr. capacity, consisting of a swing hammer pulverizer, coal feeder, air classifier and auxiliary drives. Tests so far made suggest that if mechanical deficiencies of the plant can be overcome, the pyrites process will enable a substantial reduction to be made in the sulphur content of some coals.

On flue gas washing, the methods used in this country are not regarded as practical for the U.S.A. The method considered most promising is known as the catalytic gas-phase oxidation process in which the sulphur dioxide in the flue gases is converted catalytically into sulphur trioxide and subsequently collected as sulphuric acid. Although there are a number of technical difficulties, the process has the advantages of not requiring raw materials and of producing a saleable product.

The two research projects are jointly sponsored by the Edison Electric Institute, the Association of Edison Illuminating Companies and Bituminous Coal Research Inc.

The Council and their Architect...

. . . Were walking close at hand;
They wept like anything to see
Such tracts of council land:
'If only we could build some homes
To do our council grand.'

'If seven homes on seven plots
Were built in half a year,
Do you suppose,' the Council said,
'We'd make our tenants cheer?'
'I doubt it,' said the Architect,
'Unless a Parkray's there.'

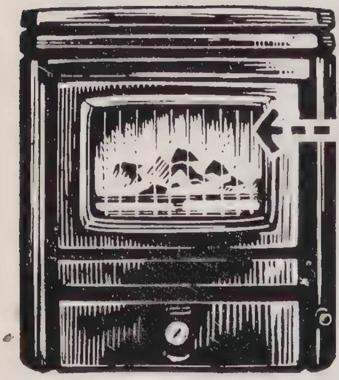
'The time has come,' the Council said,
'To talk of many things:
Of homes with warmth and central heat
(In fact what Parkray brings)
And where the water's boiling hot
Where heating has no strings.'

'An open fire,' the Council said,
'Is what we chiefly need;
Rads, towel rail, hot water too
Are very good indeed,
And as the Parkray's all enclosed,
Control is guaranteed!'

'The 77's what we want,'
The Architect did beseech,
'The cosy fire burns smokeless fuel,
The cost's within our reach,
Heats rads as well in other rooms,
It really is a peach.'

'If we could build with careful thought,
Homes that have all you've said,
Do you suppose,' the council mused,
'We'd end up in the red?'
'I doubt it,' said the architect,
With Parkray in his head.

Parkray



open fire behind glass

PARKRAY 77
It looks and feels like an open fire yet it has the greater efficiency of a totally enclosed appliance. It will effectively heat a room of up to 1800 cu. ft, plus 50 sq. ft. of radiating surface, plus all the hot water. Without hot water up to 80 sq. ft. of radiating surface.

PARKRAY 66
This smaller boiler version of the Parkray 77 heats all the hot water and a towel rail—*or* two radiators.

PARKRAY 16
Open fire high output boiler flue set which can be used to run a five radiator system or 2/3 radiators plus hot water and a towel rail.

RADIATION
PRODUCTS

RADIATION PARKRAY LIMITED, RADIATION HOUSE, NORTH CIRCULAR ROAD, LONDON, NW10

Solid Fuel Room-Heaters

A Guide to the Newest Types

IN the light of the Minister of Power's review of domestic fuel supplies, the Minister of Housing and Local Government considers that the installation of openable stoves, under-floor draught open fires or fixed gas, electric storage or oil heaters should now be regarded as "reasonably necessary works" and that the full expenditure on such installations should rank for grant.

This feature presents a selection of some of the openable stoves available to householders which will now qualify for grant purposes in Smoke Control Areas.

These types of room-heaters can stand free of the wall for maximum heat or be inset to save space. They can be opened to reveal a bright fire to sit by when needed and provide a constant even warmth throughout the room. A number of them can be supplied with a boiler to give an abundant supply of hot water and, in some cases, enough for two or three radiators as well.

THE TORGLOW

"The fire that cheers——", that is the description given on the literature for the Torglow range of glass-fronted heaters, manufactured by Jones and Campbell Ltd., Larbert, Stirlingshire.

These modern heaters, available in various designs and sizes, burn any solid smokeless fuel. They come in a choice of attractive colours and are all fitted with an exclusive non-clog shaker grate and a combined damper and throat restrictor. When used with a boiler, each "Torglow" can provide hot water for radiators or domestic purposes or both in the case of larger models. Thermostatic control is available on most larger models.

The bottom grate has a simple shaker mechanism with loose, heavy firebars ensuring easy freeing of firebed. Each firebar bar can be replaced individually, cutting renewal cost to a minimum.

The horizontal back flue outlet is standard. When a top flue outlet is required, an adaptor box can be supplied for fitting to the back of the heater. This takes the same size of smokepipe as the back flue outlet.

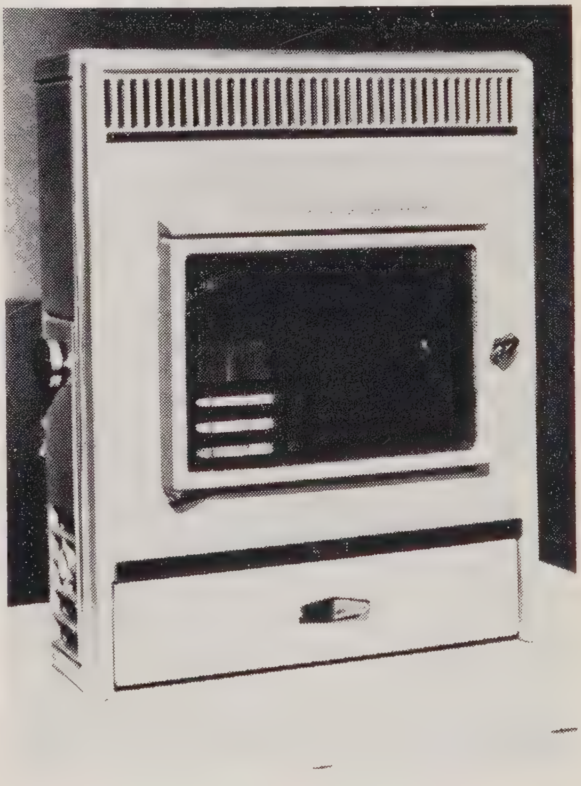
The combined damper and throat restrictor, which is a standard fitment on all models, reduces room air changes when burning with the doors open or gives extra control over combustion when the heater is installed in an exceptionally fast chimney. It is easily adjusted.

The price range of the Torglow without the boiler is from £21 0s. 6d. to £38 16s.

THE RAYBURN PRINCESS

The Rayburn Princess inset convector room heater, by Allied Ironfounders Ltd., has vertical glass strips in the hinged door. There are standard boiler, high-output boiler and non-boiler models, with either manual or thermostatic control.

The Rayburn Princess can be fitted into an existing fireplace surround in fireplace openings 16 in. or 18 in. wide, 20 in. or 24 in. high. The non-boiler model has a maximum heating capacity of 3,000 cu. ft., and costs £28 17s. (£30 5s. 6d. with thermostat control).



The Rayburn Princess

CALL THE CUC

for advice on solid fuel domestic heating

C.U.C. stands for Coal Utilisation Council. It has been in existence for over 30 years, and since the war has been the recognised official authority on the domestic use of solid fuel.

The C.U.C. can offer technical advice on every aspect of solid fuel domestic heating. Technical experts are available in each of the Council's regions.

For further information contact your local C.U.C. office

†**ABERDEEN** 258 Union Street. Aberdeen 52801

BIRMINGHAM 93-97 John Bright Street. Midland 5183

BRISTOL 39 Park Street. Bristol 20575

CAMBRIDGE 24 St. Andrew's Street. Cambridge 55274

CARDIFF 69-70 St. Mary Street. Cardiff 20501

EDINBURGH 9 Atholl Place. Fountainbridge 1566

GLASGOW 341 Bath Street, C.2. City 4975

LEEDS 9 Wellington Street, City Square. Leeds 34371

†**LONDON** Grove House, London Road, Isleworth, Middlesex. Isleworth 4492

***LONDON** The Building Centre, 26 Store Street, W.C.1. Museum 5400

MANCHESTER 4 Barton Arcade, Deansgate. Blackfriars 2852

NEWCASTLE-UPON-TYNE 18 Saville Row. Newcastle 25433

NOTTINGHAM 4-6 St. Peter's Gate. Nottingham 53203

PLYMOUTH Royal Cinema Building, Athenaeum Place. Plymouth 67864

†**READING** 183 King's Road. Reading 55323

†**TUNBRIDGE WELLS** 3 Clanricarde Gardens. Tunbridge Wells 22143

†*Regional Office only* **Heating Centre only*

THE ESSE COURTIER

Smith and Wellstood Ltd's range of free-standing room heaters are well-known. The "LO" design Courtier heater has hinged fire doors fitted with heat-resisting glass (not mica) concealed behind side panels for open fire burning. It is designed for low fireplaces and has an average heating capacity of 3,000 cubic feet. It can be supplied with a boiler for hot water supply.

The "R" Courtier has mica panelled doors and comes in five sizes, providing heat for 1,100 to 5,150 cubic feet. The three larger models, Nos. 6R, 8R and 10R can be supplied with boilers. The "S" Courtier has large glass fire panels. The 450 Esse (mica panels) heater has an average heating capacity of 2,800 cubic feet and can be supplied with either a short back type hot water boiler or a deep back type for large output.

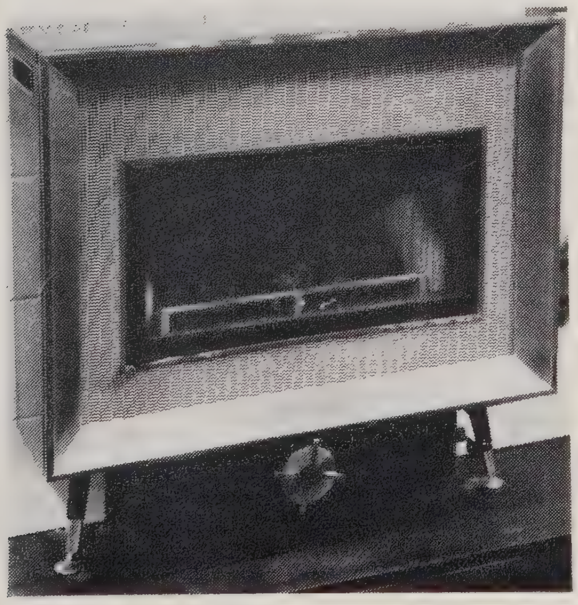
The Esse "Autovector" has been described as the heater "with robot control". When more heat is wanted, the heat tuner is adjusted and within seconds, the thermostat boosts the fire to lively brightness and thereafter maintains that output of heat. For less heat, the heat tuner is turned back and the thermostat regulates a gentle flow of warmth for as long as required and 24 hour continuous burning can easily be maintained. The Autovector No. 25 gives 3,250 cubic feet average heating capacity, No. 30 gives 3,500 and No. 50 5,500 cubic feet. All sizes are available with boilers.

The Courtier "500" is a very attractive room heater with an extra large glass fire panel which, for open fire burning, slides out of sight under the top-plate. The front panel frame is in gleaming bright metal finish.

The Esse Courtier

A smaller version in the same style is the Courtier "200".

The latest Courtier is the "Inset" room heater, which is suitable for installation in most 16 in. or 18 in. fireplace openings and can be fitted without removing the fire-brick back. A mild steel closure plate is supplied. It has a heating capacity of 3,080 cubic feet and the projection on the hearth is only 6¾ inches. The cost is £26.



The Chatelaine

THE CHATELAINE

Departing dramatically from the traditional approach, this new solid fuel heating stove is manufactured by Chatelaine Ltd., the recently formed domestic appliance subsidiary of Carron Company.

Free standing and inset models are available, featuring a large glass door, picture frame front and raised ashbox to clear hearth.

The free standing model has a heating capacity of 1,750 cu. ft. (with boiler) and 2,900 cu. ft. (without boiler). It has a lustre finish in copper, grey or black, and costs without boiler, £35; with mild steel boiler, £42 10s., with aluminium bronze boiler, £49.

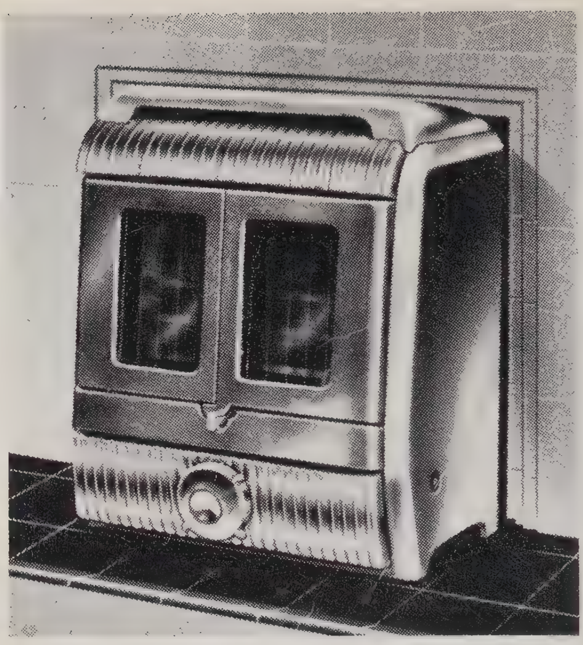
THE SENORA and WYVEX

From Whyman's Foundry Co. Ltd., Warrington, come the "New Senora" range of room heaters. The basic appearance of all models is the same and both inset and free-standing versions are available. The former will fit into most fireplace openings 16 in. wide and project only 9 inches on to the hearth. They can be supplied with a back boiler for domestic hot water or a larger boiler to supply an additional towel rail or radiator.

The front doors are fitted with heat-resisting glass and there is a shaker bottom grate for easy ash clearance. The non-heating models have a heating capacity of 1,750 to 2,000 cu. ft. The price of the inset model is £20 9s. 3d. and the free-standing one, £20 15s. 3d.

The "Wyvex 70" heater from the same foundry also has heat resisting glass panels in the doors and provides convected heat from the side and rear ducts. Air is drawn in at the base of the side panels and flows out from the slotted vents. The heating capacity of the non-boiler model is 3,000 cu. ft. and 2,000 cu. ft. with the boiler model.

The boiler rating is approximately 9,000 to 10,000 B.t.u./hr. The body of the heater fits into the normal 16 in. fire aperture and projects 12½ inches on to the hearth. The cost of the Wyvex 70 is £25 9s. 9d. without the boiler.



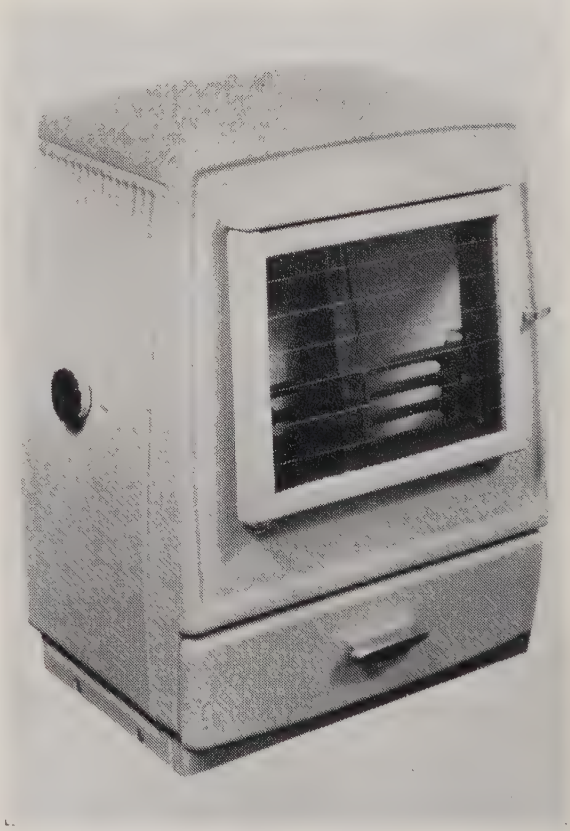
The Wyvex 70

THE RAYBURN NO. 4

The Rayburn No. 4 room heater, a re-styling with a large single glass door of the highly successful Rayburn No. 1 room heater, is a free-standing domestic solid fuel appliance and is available in both boiler and non-boiler models.

It provides all-around-the-clock heating, and will operate efficiently on all recommended smokeless fuels. Space heating capacity of the non-boiler model is 2,750 cu. ft. and of the boiler model, 1,500 cu. ft. plus 40 sq. ft. of radiator surface, or hot water (25–30 galls. cylinder).

Prices: non-boiler model, from £25 8s. 6d. (manual control), from £26 17s. (thermostat control); boiler model, from £31 15s. (manual control), from £33 3s. 6d. (thermostat control).



The Rayburn No. 4 Room Heater

THE PARKRAY

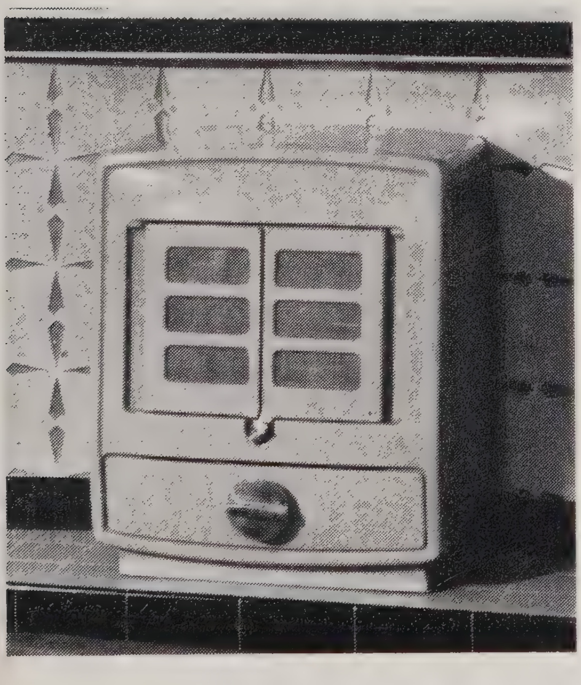
Typical of the new approach to the designing of appliances suitable for the smoke control area are those made by Radiation Parkray Ltd., a member of the Radiation Group of Companies.

The "77" is one of Radiation's range of "open fire behind glass" solid fuel room heaters, providing central heating from the living room fire. It will serve a system of up to three radiators, heat the bathroom towel rail and supply domestic hot water for the average family's needs. The "77" may also be used for domestic hot water plus selective radiator heating. This involves the use of more radiators than the boiler can fully heat simultaneously but, by selective use, wide flexibility is obtainable, making it possible to run a couple of radiators downstairs and a couple upstairs, plus hot water. Alternatively, the entire boiler output can be put to central heating exclusively, serving up to five radiators and a towel rail. It costs from £41.

The Parkray 77

A large single door, completely panelled in heat resistant glass but still providing the appeal of an "open fire" while retaining the performance efficiency of the closed stove is a feature of both the Parkray "66" and "33" appliances. Another feature is their slim line—the "33" projects only 7 inches and the "66" only 5 inches on to the hearth. The "66", with back boiler provides, at very low fuel consumption, radiant heat and convected warm air for heating a normal-to-large size living room and sufficient hot water for the average household's domestic supply, plus a small radiator or heated towel rail. Price of standard model is £35 15s.

The Parkray "33" for space heating only is available at the standard price of £24 17s. 6d.



The Queen

QUEEN HEATERS

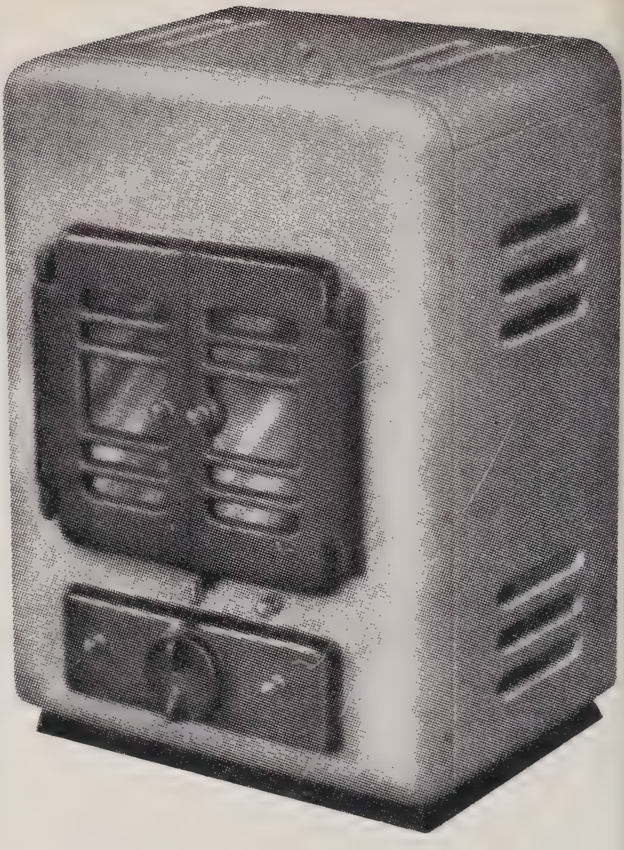
The "Queen" Heaters Nos. 1A and 2, manufactured by Grahamston Iron Co. Ltd., Falkirk, won a Design Centre Award for outstanding design. The outer casing is constructed to take in cold air at the bottom, becoming heated by contact with the inner casing of the fire itself. This warm air travels to the top of the casing and out into the room in a continuous warming stream. The fire burns solid smokeless fuels for over ten hours at a stretch, so that it needs very little attention. The rate of burning is fully controllable. The special shaker bottomgrate mechanism enables the ash to be deposited into the ashpan while the doors are completely closed—thus the dust problem is minimized.

Both the models are available with boilers for domestic hot water and the price range is from £23 13s. 6d. to £30 15s. (boilers extra).

THE MAYFAIR

The "Mayfair Belle" is the latest addition to the range of "Mayfair" stoves manufactured by Yates Haywood & Co. Ltd., Rotherham, and retains the well-tried fundamental principles of construction applied to its predecessors. It is lined with firebrick and fitted with louvred shape front bars which prevent cinders from falling on to the hearth when the doors are open. It can be fitted with a boiler for domestic hot water supply.

The price of the Mayfair Belle without boiler is £26 16s. 3d. Other Mayfair heating stoves range from £13 6s. 6d.



The Mayfair

THE CALEDO

Manufactured by Lane & Girvan (1961) Ltd., Bonnybridge, the "Caledo" domestic heating stove is fitted with mica-panelled doors, a shaking bottom-grate, an effective draught regulator in the ashpit front and slotted top and side panels for even distribution of radiated heat. A high-pressure wrought iron or copper boiler can be supplied, giving an output of approximately 9,000 to 12,000 B.t.u./hr. It can be either free-standing or inset and 18½ in., 21 in. or 25 in. wide. The price without boiler ranges from £22 10s. 6d. to £28 19s. 2d.

Models No. 0, 1 and 2 have swing-type doors whilst No. 54A has retracting or concealed fire doors.

Central Heating—What it Costs for Your Home.—Published by Thomas Potterton Ltd. and free on application, this new 32-page booklet—the layman's guide to central heating—replaces the one published in 1961, of which more than three-quarters of a million copies have been distributed.

It tells the householder, without bias, what he wants to know about central heating—what it is likely to cost him, the fuels available and the various systems. Most of the information follows that of the original booklet, but with the full inclusion of details of electric night storage heaters. There is now more on the subject of insulation and some indication of costs and savings is given. Running costs have been brought up-to-date in the light of recent increases in fuel prices.

The booklet has a new design and is available free on request by telephoning Miss Meredith at VANdyke 0422 or by writing to her at Thomas Potterton Limited, 20–30 Buckhold Road, London, S.W.18.

Year Book of the Heating and Ventilating Industry, 1963/64. Published by Technitrade Journals Ltd., at 15s., the 17th edition has been, like its predecessors, compiled in collaboration with the Heating and Ventilating Contractors' Association. It provides in one volume of 632 pages technical, contractual and other trade information for the benefit of architects, consulting engineers, surveyors and others in close contact with the heating and ventilating industry.

The contents include an index to heating and ventilation literature published in 1962 (including Atmospheric Pollution, Boilers and Boiler Firing, Chimneys and Flues, Dust Collection, Fuels and Combustion and Domestic Heating), a selected list of British Standards, a list of H.V.C.A. members, a Buyers' Guide, Trade Names, Manufacturers' Addresses, Technical and Trade Associations and a list of consulting engineers. For easy reference, each section has been printed on different coloured paper and there are 76 pages of displayed advertisements.

NO DIESEL SMOKE WITHOUT FIRE*

It is caused by

- **Poor injector maintenance**
- **"Fiddling" for more power**
- **Small wear margins**
- **General mechanical wear**
- **Choked up filters**

It sounds like an acute case of teaching grandmother to suck eggs, but the reason a diesel engine smokes is because there has been incomplete combustion in the cylinders. Put another way, you could say oxygen starvation.

This incomplete combustion leads to an exhaust which contains, in varying degrees, a quantity of carbon. It is this carbon, suspended in the exhaust as fine particles, which makes smoke visible and points to an inefficient engine.

Now what are the many and varied reasons for this state of semi-combustion? Number one is that the fuel is not reaching the chambers in a fine enough spray for it to be completely burnt. Secondly it could be that the amount of air present in the fuel is insufficient for full combustion. Likewise, it could also be that too much fuel is being injected for the maximum air available. Finally it could be poor quality fuel. These, basically, are the root causes but some are more "root" than others.

Maladjusted Systems

Leading on from these basic causes, it is acknowledged that the biggest single contributory effect to black smoke comes from maladjusted fuel injection systems. A lot of the blame for this can be apportioned to lack of maintenance of injection systems or deliberate "fiddling" with governor settings and fuel stops to get more power. But maintenance, or lack of it, is not the only guilty party. Some criticism can also be laid at the door of manufacturers whose quoted power outputs are, more often than not, taken at a fuel injection setting which allow little room for wear and tear as far as smoke output goes. Operators, and, by public demand, the Ministry of Transport, want more power not less and we are likely to hear more about this from the Ministry in the near future.

Whilst on the power subject I must point out that overloading a vehicle does not in itself cause black smoke. But the fact that an engine is perpetually overloaded does cause more rapid wear and tear and consequently more smoke. Still, general mechanical condition is a comparatively minor cause of smoke as against the main cause of faulty injector systems. A more likely side effect of overloading is the temptation—not resisted—to do a bit of fiddling with the amount of fuel supplied to get more power, as I mentioned earlier. This "fiddling" is probably the major reason for malfunctioning injectors.

Another cause of injector guilt is mechanical deterioration and malaise in the system itself possibly coupled with choked breathing. All these can add up to smoke and when you remember that it only takes one per cent of injected fuel to remain unburnt to produce a fair old cloud, you can realize how careful you have to be with injectors.

For a tip from the horse's mouth, Simms says it is advisable to have all components of the fuel injection system checked every 10,000 miles or 500 hours of running. If this is done under recommended conditions, adds Simms, its injection pumps at any rate should operate up to 300,000 miles without any serious deterioration through wear.

Getting down to detail, the major

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* Reproduced by kind permission from *Transport World*, January, 1964.

offenders in the fair-wear-and-tear deterioration of an injector system are the fuel delivery valves. Settings which are too low cause smoke and if you drop 20 atmospheres you have a fair-sized smoke screen on your hands. In this respect it is wise to take into account the bedding down action of the nozzle seats of reconditioned injectors—a 5,000 mile check is a good idea. Nozzle seats can also be put out of true by too-tight clamping—this is a minor cause but it does crop up.

Air Starvation

Perhaps not so minor is air starvation, usually the result of choked filters and particularly so with the ultra efficient paper element variety. Regular checks should keep this at bay. Another obvious culprit as far as air starvation goes is the part obstruction of ports, etc., with carbon deposits.

On the subject of filters, it is worth mentioning fuel filters. These should be changed regularly to ensure a clean fuel system—it doesn't take much muck at the delivery end to start a cloud. The fuel itself is a minor cause in engine smoking but a poor quality fuel, coupled to one or several other minor faults can add up to what the Ministry's examiners regard as an unreasonably smoky exhaust. One of the smoke inhibiting factors in fuel is the cetane (ignition quality) content. A higher cetane number can cut down the amount of smoke produced by an engine but the amount that can be done here is fairly marginal. The cetane numbers in fuel do vary according to the make but the information is not readily available from the petroleum companies. You will have to do some arm-twisting if you are really fussy. Additives do not have much effect on smoke except to make it smell nicer.

Again on a minor note, governors can contribute to smoke. The pneumatic type has been found to give most trouble because of the possibility of diaphragm leakages. The hydraulic governor is the best but it costs a fair bit more.

So, there we are—most of the causes of smoke, be it black, white, blue or what-have-you. The answer to most of the problems as you can see, lies in regular maintenance checks of the injector coupled with similar checks on fuel and air filters. Stick to this and you will not go far wrong and, we hope, you should not fall foul of Mr. Marples and his merry men.

J.R.S.

The Broader View

We live in a thin lamination on the surface of our small planet, between an ocean of air above, and the rocky crust beneath. Up in a rocket it grows steadily colder, down in a mine it grows steadily hotter. The air must be pure if we are to breathe; the soil must be arable if we are to eat; the water must be clean if we are to drink. Two-thirds of the globe is covered with salt water, while polar ice, tundra, mountains, swamps, deserts, and rain forest reduce living space to not more than one-eighth of the globe's surface.

Light, air, water, soil, plants, animals, man are linked in an ecological unity. Any damage done to one has immediate and serious repercussions on the others. Man has created deserts by overgrazing in the past, but these are minor compared to the massed assaults on living space now in process. Not only spread-city, but pollution of air and water, strip-mining, dust storms, the effects of pesticides as argued by Rachel Carson, fall-out, sonic boom, radioactive wastes from atomic power plants dumped into rivers and the sea, the disruption of the Van Allen belt by nuclear explosions in outer space—all are hacking away at our thin lamination

—Stuart Chase, in *Saturday Review* (U.S.A.), Jan. 26, 1963

Carbon Monoxide in Small Doses

(*From* Time, *New York, January 17, 1964*)

Everyone knows what happens when a would-be suicide closes the garage door, runs a hose into his car from the tail pipe, and sits inside the car with the engine running. Carbon monoxide, in such heavy doses, is one of the deadliest of gases. It gets into the blood and starves the brain of vital oxygen. The victim turns red and usually dies. But doctors have been arguing for decades about the effects of small doses of monoxide poison over long periods. Only recently have they begun to collect evidence that such small doses may do permanent damage to the brain.

One trouble is that moderate monoxide poisoning produces symptoms so confusing that they baffle the most ingenious and elaborate diagnostic methods. In the *New England Journal of Medicine*, Yale University Neurologists Gordon J. Gilbert and Gilbert H. Glaser reported the particularly bizarre case of a New Haven traffic cop who sometimes seemed to be "overly jocular and playful" but more often was true to his trade—nervous and irritable. Nearly every afternoon, after several hours on duty, he felt dizzy and sleepy and got the staggers. Sometimes he became unconscious for 15 minutes to 1½ hours.

After a year of these symptoms, the cop took a transfer to the police garage, where he worked as a mechanic. He got no better and wound up in the Yale-New Haven Medical Center, where he soon improved and began gaining weight—only to have a severe relapse after six months back on the job. What helped the doctors clear up his case was the fact that the cop sometimes took a holiday down on the farm, working a tractor that required him to walk behind it. Helped by tractor-engine exhaust, his vacation "cure" gave him the same nervous symptoms as he had had in the city: abnormal brain waves, mental dullness, inability to concentrate, and tremor.

Most medical men believe that the body flushes out carbon monoxide quickly after a return to breathing pure air. The Yale neurologists say this may not always be true after repeated exposures, and certainly not for all people: the New Haven cop had a high blood level of monoxide 30 hours after exposure to the fumes. European experiments with lab. animals confirm the growing suspicion that leaky stovepipes, rusted-out mufflers, and running a car for even a few minutes inside a garage may involve greater and more subtle dangers than doctors had realized.

Housing and Planning Conference—The 27th World Congress for Housing and Planning will be held in Jerusalem form June 21 to 28, 1964. The Town and Country Planning Association are organizing group air travel for British delegates and information may be obtained from them at 28 King Street, London, W.C.2.

Smokeless Fuel for Belgium—It is reported that three Belgian collieries in the Campine region have formed a company to make smokeless agglomerates. New installations costing £3 million are to begin output in 1965. Two production lines will each produce 220,000 tons of smokeless fuel a year.

Still Fewer Bottle Ovens

The number of coal-fired bottle-ovens in use within the Stoke-on-Trent area dwindles steadily. From more than 2,000 it has now dropped to 70, according to the annual report of the city's Public Health Department. The fall is expected to continue.

Diesels in Bradford

In support of its clean air policy, Bradford has started a campaign to reduce smoke emissions from diesel vehicles. 250 firms in the city operating diesel transport have received a circular from the police and health departments.

Appointment—The National Coal Board have appointed Dr. R. B. Sims as Director-General of their Research and Development Department (Coal Processing and Combustion).

Coal in Britain Today—This 24 page booklet published by the National Coal Board is a useful digest of information about the organization of the industry, its growth, output, finances, and other aspects of general interest. It includes some useful statistical material and a number of diagrams, some of which illustrate encouraging trends in mechanization, productivity, etc.

REXCO IN SCOTLAND

New Plant Opened

The new Scottish plant of the National Carbonizing Co. Ltd., the manufacturers of the well-known "premium" fuel "Rexco" was officially opened on January 14, 1964. The plant, the site of which was selected in collaboration with the N.C.B. is at Comrie Colliery, Oakley, near Dunfermline.

The plant, consisting of seven carbonizing retorts, cost a little under £500,000, and was built by local Scottish contractors in conjunction with Newton Chambers of Sheffield. It will take about a quarter of the output of the adjoining colliery, carbonizing 2,500 tons of coal, to give 2,000 tons of "Rexco" per week. All of this will be sold in Scotland, and will double the quantity of fuel available there.

The opening ceremony, the pressing of a button to set the coal tippler in operation, was performed by Mr. Tom Sutherland, who was about to retire after 51 years' service in the Comrie mine. After the ceremony and inspection of the plant guests were entertained to lunch at Broomhall, the home of Lord and Lady Bruce. The speakers after the lunch were the Hon. Edward Davies, Chairman of the company, and R. W. Parker, Chairman of the Scottish Division of the National Coal Board.

Mr. Edwards gave the unexpected information that it was actually possible for them to manufacture the fuel in England and transport it to Scotland more cheaply than at the Scottish plant—simply because the coal required cost only £11 per ton at Mansfield, and £13 at Comrie. He explained that they had taken a long-term view. Not only were freight charges likely to rise, but they wished to be close to their Scottish market and to give it more certain service.

The new Rexco Plant at Comrie Colliery, near Dunfermline

Conference at Dudley

A one-day conference on air pollution, convened by the Midlands Centre of the Association of Public Health Inspectors, was held in the Town Hall, Dudley, on February 12, 1964. There was a notable platform of speakers to deal with the domestic aspects in the morning and the industrial in the afternoon.

The conference was opened by the Mayor of Dudley, Councillor W. H. W. Poulton, J.P., who welcomed the delegates from local authorities and many interested bodies.

The Chairman, H. E. T. Lowbridge, reminded delegates of the role Dudley had always played in the campaign for clean air in the West Midlands. Twelve exhibitions had been held in the area and the first, opened by Sir Hugh Beaver, had taken place in September, 1956.

The first speaker, S. Cayton, C.P.H.I., West Bromwich, regarded the White Paper on Domestic Fuel Supplies and the Clean Air Policy as a challenge to greater effort to implement the Act. In confronting the slow progress made in overcoming prejudice against coke, delegates could take comfort from the contribution made by the gas industry to provide a clean and convenient form of domestic heating. He referred to the sulphur-free nature of gas and called for the installation of gas, oil and electric storage heater appliances in new premises in the proportion of one out of two instead of the 1–3 proportion at present envisaged. This would forestall a fuel shortage in 1970.

W. R. Branson, Deputy Chairman, West Midlands Gas Board, surveyed the availability of solid smokeless fuel and expressed the view that allegations of a shortage of Gloco had been used to delay the clean air programme; there had never been a shortage, in fact at the end of last winter despite its severity a small stock had remained. Mr. Branson pointed out that many thousands of householders had used gas coke for years without any compulsion by smoke control order because they found it clean, convenient and economical.

The White Paper, he said, recognized the change which the gas industry was undergoing. Modern oil gasification processes were rendering uneconomic the continued operation, at present prices, of coal carbonizing plant of the traditional type though the more recently erected larger carbonizing plants would probably continue to operate for some years. When they became due for major reconstruction, it would, however, be difficult to justify the expenditure necessary.

The trend away from coal carbonization and coke production might be slowed, though probably not halted, by increases in the price of coke. This would tend to reduce demand and encourage continued production.

Mr. Branson concluded by saying "our maximum daily output in the severe weather last winter was 354 million cu. ft. Our plans for 1968/69 provide for meeting a maximum of 540 million cu. ft./day, a 45 per cent increase. Should experience over the next year or two indicate that the rate of growth of sales has been underestimated, there would be little difficulty in accelerating the construction of new plant. Clean Air can be associated with a rising standard of comfort as well as of cleanliness, with fuel economy and with benefit to health. When Clean Air can be secured at a profit we surely cannot hesitate".

The next speaker was E. H. Browne, C.B.E., Deputy Chairman of the National Coal Board. He emphasized the tremendous boon to householders made possible by the recent changes in the administration of the Act, enabling them to install the various types of attractive glass-fronted openable stoves or solid fuel room-heaters. These were able to burn the cheapest type of boiler fuel at very high efficiency.

Mr. Browne reminded his audience of the contribution the Coal Board had made in connection with Clean Air; by research and development and modernizing their own plant and installations. He referred to the continuing popularity of the open fire but pointed out that the old unimproved fire with its 20 per cent burning efficiency put it into the luxury class.

There could be temporary difficulties for open fire users in some cases if gas coke production was run down too quickly. But area gas boards were sensibly co-operating with local authorities and other fuel suppliers as far as possible. In the meantime, the National Coal Board were planning to increase the output of their open fire fuel, Homefire, which was already in limited production at the pilot plant stage, and the producers of the other premium quality open fire smokeless fuels, Coalite and Rexco, also had plans to increase production.

G. S. Buckingham, Deputy Chairman, Midlands Electricity Board, regretted the chastisement of electricity implicit in the White Paper. The contribution of electricity to clean air would take many forms—the abundant and economic off-peak heating at ¾d. per unit and the bar heater, threatened but not prohibited would continue to serve many households. The Board now had a storage capacity almost equal to the gas industry and were using 65,000,000 tons of coal in the Midlands to meet the enormous demand for units.

Sir John Charrington, Chairman of the National Federation of Coke Distributors' Association, refuted the suggestion that there was a shortage of solid smokeless fuel or the likelihood of one occurring in the near future if the right appliances were used. He warned against any attempt to coerce householders into using appliances they did not like. Such a step would cause the re-emergence of opposition to clean air. The love of the open fire was a fact that had to be accepted and patience and encouragement were needed to wean the reasonable British people away from it.

The White Paper could, he thought, be a blessing in disguise as Gloco had never been an easy fuel to sell. Sunbrite, the abundant alternative for the openable stove would appeal to local authorities taking the big view of the situation. The room-heater now substantially improved was a status symbol approximating to the television aerial a decade ago.

The last speaker in the morning session, devoted to domestic aspects was E. F. Westray, the divisional Manager for the Domestic Fuels Department of Shell-Mex/B.P., Ltd.

He stressed the competitive aspects of oil and how this was reflected on the price level despite the unfortunate factor of tax. Oil reserves were worldwide and enormous, sufficient to take us well into the next century at the present level of consumption.

Britain, he said, had increased her refining capacity twenty times in the last thirty years. The domestic market was most important to the oil industry and those interested in clean air would do well to ponder the ubiquitous role of the portable paraffin heater, the sale of which had increased from 1,000,000 to 12,000,000 in recent years. He stressed the importance of sulphur dioxide.

In the ensuing discussion reference was made by Mr. Crawford, C.P.H.I., Brierley Hill, to the contribution industry had made to cleaning the air. He did not know the total figure, but one industry in his area had spent £140,000 on grit and dust arrestment equipment.

Other speakers referred to the difficult and costly problem of grit in small sizes and of fume prevention, and the anomaly of exempting Crown property. A plea was made for greater technical knowledge and a last-ditch defence of bituminous coal in the open fire.

The main speakers replied to the

nany points raised and Mr. Browne xpressed his conviction that they vould find a way of burning bitu- ninous coal smokelessly for the omestic consumer.

In the afternoon, A. Archer, .P.H.I., for Halesowen opened the ession on Industrial Aspects. During nis session D. Armstrong of Industrial uels Department, Shell-Mex/B.P., . A. Howson, Marketing Director, Vest Midlands Division, National Coal Board, and A. H. Pinder of N.I.F.E.S., contributed papers.

Smoke Control Delayed.—From press uttings received, a further 30 local uthorities have postponed smoke control rea plans because of the new arrange- nents necessary.

Purer Air and Water

The town of Hampstead, Long Island, U.S.A., has recently decided to install a refuse disposal plant which is the first in the country to utilize its heat to convert sea-water into fresh water.

Being built at a cost of over £2,000,000 by the American Machine and Foundry's Maxim division the refuse disposal plant will include four heat recovery evaporators. At full capacity, the units could provide up to 450,000 gallons of fresh water daily. The units will use the heat from the incineration of the refuse to convert Atlantic Ocean water into water so pure that a million pounds of it will contain less than ten pounds of salt—compared with 75 lbs. in the New York City municipal water supply. The operation will also make possible better control of air pollution, smoke density and odours emitted from burning of refuse.

Comfort in the Home Exhibition

llustrated above is the section of particular clean air interest, showing some of the new as room heaters, at the recent "Comfort in the Home" exhibition at the R.H.S. hall in Vestminster. Organized by the Eastern, North Thames, Southern and South Eastern Gas Boards, the exhibition displayed in outstandingly attractive ways, on a functional basis, he most up-to-date appliances and methods of using gas. That is, the stands were devoted o explaining and demonstrating aspects such as, for example, planned kitchens, water eating, central heating, flues and terminals, and—we were pleased to see—clean air

Pollution Problems of High Flats

The Annual Report of the Scientific Adviser, Public Health Department, London County Council, for 1962, just published, has sections on air pollution, environmental radioactivity and the ventilation of vehicular tunnels. The following extract from the air pollution section directs attention to a hazard that calls for foresight when tall flats are being planned:

> A problem of increasing concern since the advent of tall blocks of flats is the smoke nuisance from neighbouring chimneys experienced by residents in the upper storeys. In one such situation, which was investigated because the chimney of a boiler house was of newer construction than the flats, it was found that the concentration of sulphur dioxide at a sixth floor flat at a distance of 140 feet from the chimney averaged 1,800 microgrammes per cubic metre during at least 40 per cent of a five-day period, when the wind was in the right direction. This was ten times the normal atmospheric concentration at that time, and 55 per cent above the "smog" level. The building of tall blocks within range of power station chimneys presents a special problem and there is need for more information on the behaviour and dispersal of high-level plumes.

Fuel Economy, 1964

This annual review, published by the Federation of British Industries, contains ten articles on aspects of fuel efficiency in industry. Of special interest to many will be a survey, by Russian authors, of the power resources of the U.S.S.R., their development and use. Others deal with the role of plastics in improving thermal efficiency, the question of thermal efficiency in heated factory buildings, the expanding use of town gas in industry, and—not without interest in view of the present Clean Air Bill—a review of fuel efficiency in Northern Ireland.

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AIR POLLUTION ABSTRACTS

Abstracts of Papers on Fume Arrestment presented at Meeting of The Iron and Steel Institute on November 26 and 27, 1963, published by the Institute 1964 in Special Report No. 83. "Fume Arrestment"

712. Gas Cleaning in the Iron and Steel ndustry. Punch, G. and Young, P. A. The paper discusses the essentials of gas leaning theory and provides information n the characteristics of available units. The first part considers the theoretical rinciples on which the operation of gas leaning equipment depends. The major ategories, inertial separators, impingement separators and electrostatic precipiators, are discussed with special reference o the problems of the iron and steel ndustry. The concepts of target efficiency nd effectiveness of particle collection re discussed, experimental work in rogress is described, and reference is made to the standard texts on the subject. The second part analyses the characterisics of dust from specific steelmaking rocesses, emphasizing the variety of actors which may affect collector perormance, and describing methods of ume control which may be adopted. Records of actual installations are given, nd operational processes and results discussed.

713. The application of electrostatic recipitation to the control of fume in the steel industry. Watkins, E. R. and Darby, K. The paper is concerned with the application of electrostatic precipitation o the steel industry for the control of fume from processes where the large-scale use of oxygen has resulted in the emission of high concentrations of red oxide fume. Factors affecting the efficiency of fume emoval and precipitator efficiency are discussed, a comparison is given of the merits of wet and dry type precipitators, and finally reference is made to the economic aspects of the problem.

714. Dry electrostatic precipitators on open-hearth furnaces. Boyce, H. P. The paper includes a brief description of The Steel Company of Wales' Abbey melting shop and some information concerning he size and design capacities of the four 400 ton furnaces, which are connected to he gas cleaning plant. The arrangement of the gas cleaning plant is considered ogether with the possible alternatives and reasons for selecting the adopted arrangement are given. The design specification for the precipitators is discussed in relation to the waste gas volumes and the requirements of the Clean Air Act. The operational experience is also mentioned with particular reference to the difficulties encountered with isolation dampers and dust handling equipment. Finally, the results obtained from the plant are indicated.

715. Waste Heat Boilers for Open-Hearth Furnaces. Ungoed, W. P. C. and Needham, W. J. The paper deals with the application of waste heat boilers as gas coolers, compares the smoke-tube and water-tube types of boilers, and discusses their design features, heat transfer, tube formation, and steaming pressures. Methods of draught control are described. The section on plant operation and maintenance deals with boiler cleaning methods, shot cleaning for "on-load" duties, and the statutory requirements on maintenance. Finally, the economy of the waste heat boiler is considered; waste heat steam credits, power generation, and capital returns on specific "back pressure" type units are illustrated with figures for equipment currently in operation.

716. Fume Cleaning in Ajax Furnaces. Jackson, A. The paper describes the combination of waste heat boiler and dry electrostatic precipitator used for the collection of iron oxide fume on Ajax furnaces, dry cleaning having been selected especially to minimize water supply and pollution problems. The author concludes that the combined system is satisfactory, but that the problem of cleaning the waste heat boiler needs further study. The steam credit is equal to the total operating cost of the waste heat boiler and precipitator (including depreciation). Pelletizing brings a credit in allowing the collected dust to replace foreign ore in the steel furnaces instead of replacing local ore at the ironworks.

717. Operating Experience with Oxygen-Assisted Open-Hearth Furnaces. Lloyd, H. B. and Bacon, N. P. A brief description is given of the general layout of the "M" scheme development at Cardiff, which involves the application of tonnage oxygen for bath jetting. The electrostatic precipitator plant installed is described, and operating experience with individual components of the system is reported on. Modifications and refinements to the original equipment are detailed, and further improvements suggested. The effects of the gas cleaning equipment on furnace operating techniques are outlined.

718. Dry Electrostatic Precipitator and Waagner-Biro Wet Washing Systems. Mitchell, R. T. Richard Thomas and Baldwins Ltd. have installed electrostatic precipitators at Ebbw Vale and wet washers at Spencer Works. The conditions to be met in each case are defined, and the reasons for the selection of specific equipment explained. The two systems are compared from the points of view of efficiency and operating cost, and the modifications which have proved necessary to remedy operational difficulties are detailed to enable a more realistic assessment to be made of comparative capital expenditure. The paper concludes with a section on the re-use of recovered dust, and new equipment is outlined.

719. Operating Experience with Boilers after LD Converters, and their future developments. Markow, D. K. The paper discusses the fundamental characteristics of the evolution of the system of steam generation, together with the difficulties involved in its development. A critical analysis of the typical design characteristics LD cooling equipment is also given. The design requirements imposed as a result of operating experience are set out, and the modifications introduced are described with particular emphasis on the evolution of hood profile. Further developments, including the central boiler and permanent load boiler, are outlined, and the economic advantages of the system are discussed.

720. Gas Recovery without combustion from Oxygen Converters: the I.R.S.I.D.-C.A.F.L. Pressure Regulation Process. Namy, G., Dumont-Fillon, J, and Young, P. A. The paper discusses the recovery of CO without combustion through the control of good pressure. It deals with the major parameters involved, with the inherent problem of safety, and with the measures adopted for complete monitoring and control. The nature of the fume produced dictates a high-efficiency gas cleaning system, and the techniques introduced, including complete air purge of the circuit after each operation, are described. The paper reports on the results of pilot plant trials and of full-scale operations, which indicate the economic and technological potential of the process.

721. Converter Waste Gas Cleaning by the "Minimum Gas" Method at Fried. Krupp. Hoff, H., and Maatsch, J. Steelmaking in an oxygen converter evolves 60-80 nm^3 gas/ton of pig iron, with a high CO content and about 200g dust. By the dust removal methods so far in use, the gas is burned before cleaning with excess air, thus producing a great quantity of heat and very much increasing the amount of gas to be cleaned. Using the Krupp converter waste gas cleaning system according to the "minimum gas" method, the amount of air getting into the converter gas, and subsequent combustion, are very much reduced by having a suitable shape of hood with a curtain of air round it and having controlled gas exhaustion. Without this, gas can escape around the converter. The cooled, clean, high-CO gas can either be burned by a torch or recovered for further use. High-pressure regulated scrubbers, which can be alternated with washers for fine dust removal, offer a good solution to gas cleaning problems. The whole apparatus can be housed along with the waste gas pipe and the burner in a readily inspected tower with very small demand on space and gas lines.

722. Operation and Economy of the Oxygen Converter Gas Recovery Process (OG Process). Morita, S. The paper reports on the equipment, installation, operational results, and economy of the oxygen converter gas recovery process. The components and instrumentation of the process are described. The process combines high dust collecting efficiency with high-yield steelmaking operations. Operational records are given, and the characteristics of OG dust analysed. The economic advantages of the process are detailed in comparison with the waste heat boiler, and possible future developments are outlined.

723. The Control of Fume from Arc Furnaces. Davies, E., and Cosby, W. T. Various methods are discussed for containing the fumes formed during the production of steel in electric arc furnaces, with particular reference to the application of the "direct extraction" technique. The paper indicates the premises on which the Brymbo extraction system was designed, how far these were supported by practical experience, and how the latter emphasized, among other factors, the importance of maintaining adequate facilities for the ignition and combustion of inflammable gases emanating from the furnace, not only during the oxygen blow but also other phases of the steelmaking cycle. It is concluded that, providing attention is paid to orthodox combustion practice and engineering design principles, the control of fumes may be safely and effectively achieved with a resultant appreciable saving in the size and hence cost of gas cleaning units. The advantages of the "direct extraction" technique become more pronounced as the capacity of the furnace increases.

724. Direct Fume Extraction and Collection Applied to a Fifteen Ton Arc Furnace. Douglas, I. H. The paper describes the direct fume extraction and collection plant fitted to a 15 ton arc furnace and designed primarily to deal with the fume produced during oxygen lancing. The fume is extracted through the side of the furnace shell, cooled in a water tube heat exchanger, and cleaned in a bag filter plant; the exhaust gases satisfy the relevant Clean Air Regulations, and have a solids content less than 0·05 grains/ft^3.

725. Direct Fume Extraction for Large Arc Furnaces. Holland, M. and Whitwam, K. B. The development of a suitable fume extraction and cleaning system for large electric arc furnaces using tonnage oxygen is taken in logical sequence through pilot plant trials to the final design stage. The choice of a wet cleaning plant is influenced by the ease of hot gas conditioning and fluorine removal, the economics due to reduced volumes at the outlet, and an improved effluent treatment and disposal system. The steps taken to ensure complete combustion of the gases evolved during the furnace cycle by the use of an adjustable sealed connection to the furnace, combined with a controlled combustion air and ignition source, are described in detail. Control of furnace pressure is achieved by control of speed of the fan and a water-cooled damper in the furnace offtake. Operational experience and plant reliability are discussed, together with reasons for modifications found to be necessary.

GENERAL ABSTRACTS

726. Carbon as a Carrier Mechanism for Irritant Gases. Boren, H. G. (Arch. Env. Health, 1964, **8**, No. 1, 119-124.) The question of whether focal areas of lung damage can be produced by mechanisms which concentrate relatively large amounts of irritant gases in sharply localized portions of lung has been investigated by exposing mice to carbon with adsorbed NO_2. Neither a group of control mice nor mice exposed to inhalation of carbon alone demonstrated any anatomic abnormality of the lung. Mice inhaling NO_2 in concentrations of 250 ppm or greater developed pulmonary edema, but neither single nor repetitive exposures produced parenchymal lung lesions. Mice exposed to inhalation of carbon upon which NO_2 was adsorbed developed focal destructive pulmonary lesions. The thesis is presented that carbon acted as a carrier mechanism whereby high local concentrations of NO_2 within the lung were achieved. Carbon is not considered to be a unique adsorbed irritant to produce the observed effects. The significance of carbon insofar as air pollution is concerned is not only that it indicates the inhalation of potentially polluted air but also that it at times may allow the transport of damaging substances into the lung, depending upon the conditions present when the carbon was formed and the subsequent history of the newly formed carbon particle before it is inhaled.

727. Chronic Respiratory Disease in Great Britain. McKerrow, C. B. (Arch. Env. Health, 1964, **8**, No. 1, 174-179.) Three different approaches to the investigation of chronic respiratory diseases have been considered. The epidemiological technique, using a standardized questionnaire and simple measure of the ventilatory capacity, has been valuable in studies of bronchitis. The difficulty of obtaining adequate past history of exposure to respiratory hazards and also their multiplicity in urban environments may hamper the interpretation of results. Laboratory experiments on volunteers can demonstrate the effects of artificial dust clouds on the airway resistance. The method is a satisfactory one for detecting acute changes. The prospective study in which continued measurement of the subject's environment is linked to repeated physiological studies may overcome some of the difficulties of the other approaches. An example is given demonstrating a cyclical change in ventilatory capacity over the year which may be linked to atmospheric temperature changes.

728. Atmospheric Dispersion of Dust. Wedin, B. (In Swedish, V.V.S. 34, 1963, No. 8, 281-287.) The paper discusses the problem of gases with the same density as air and the vital importance of the horizontal spread of noxious substances or organisms in many cases of atmospheric pollution. The meteorological trajectories of drifting clouds of atmospheric impurities are complicated to a considerable extent by such topographical factors as mountain ranges, valleys and forests. Up to the present time no better method of studying such complex situations has been found than that of making local sampling tests with tracer substances. By this method it is possible to determine the distribution and concentration of atmospheric impurities over enormously wide areas. Much valuable experience has been gained with the aid of this technique in Sweden by the National Defence Research Establishment. Apart from the movements of air masses, the concentrations of airborne clouds of particles are affected by fallout, impact effect on surfaces, washout, and atmospheric diffusion. These physical factors, however, generally only play a fairly minor part. Airborne infection is a phenomenon that has long been known in botanical circles. Its medical significance has not yet been established. The possibility of its deliberate use in time of war cannot be ruled out, and this has led to intensive study in many countries of "biological weapons". The decisive factors as regards the efficiency of such weapons are manner in which they are spread in a horizontal direction by the atmosphere and their ability to survive this process.

729. Some Technological Consequences of the Clean Air Act. Carter, J. S. (Chem. Eng. Dec. 1963, **41,** CE340-349.) A restricted number of topics is included in the paper, emphasizing developments of chemical engineering interest. The paper reviews: *Processes* (the classical alkali [saltcake] process; the Claus kiln reaction, and the production of zinc. *Distillation* as instanced by tar and petroleum practice). *Tonnage quantity gases* (chlorine and oxygen). *Fume arrestment, and chimney dispersal.* Discussion, which is of considerable interest, follows the paper.

730. The Centenary of the Alkali Act. Colehan, J. E. (Chem. Eng., Nov. 1963.) In this paper, to the Midlands Branch of the Institution of Chemical Engineers, the District Alkali for the South and West of England gives a historical background to some industries in that region, and shows how the Inspectorate, with the co-operation of industry, has helped to improve amenities by controlling emissions from registered works.

Smokeless Boilers for the Small Terraced House

A new domestic gas-fired boiler, which has been designed for the older small terraced and cottage-type houses to replace often antiquated solid fuel boilers has been introduced by Thomas Potterton Ltd. It is fully automatic in control and yet not dependent on electricity.

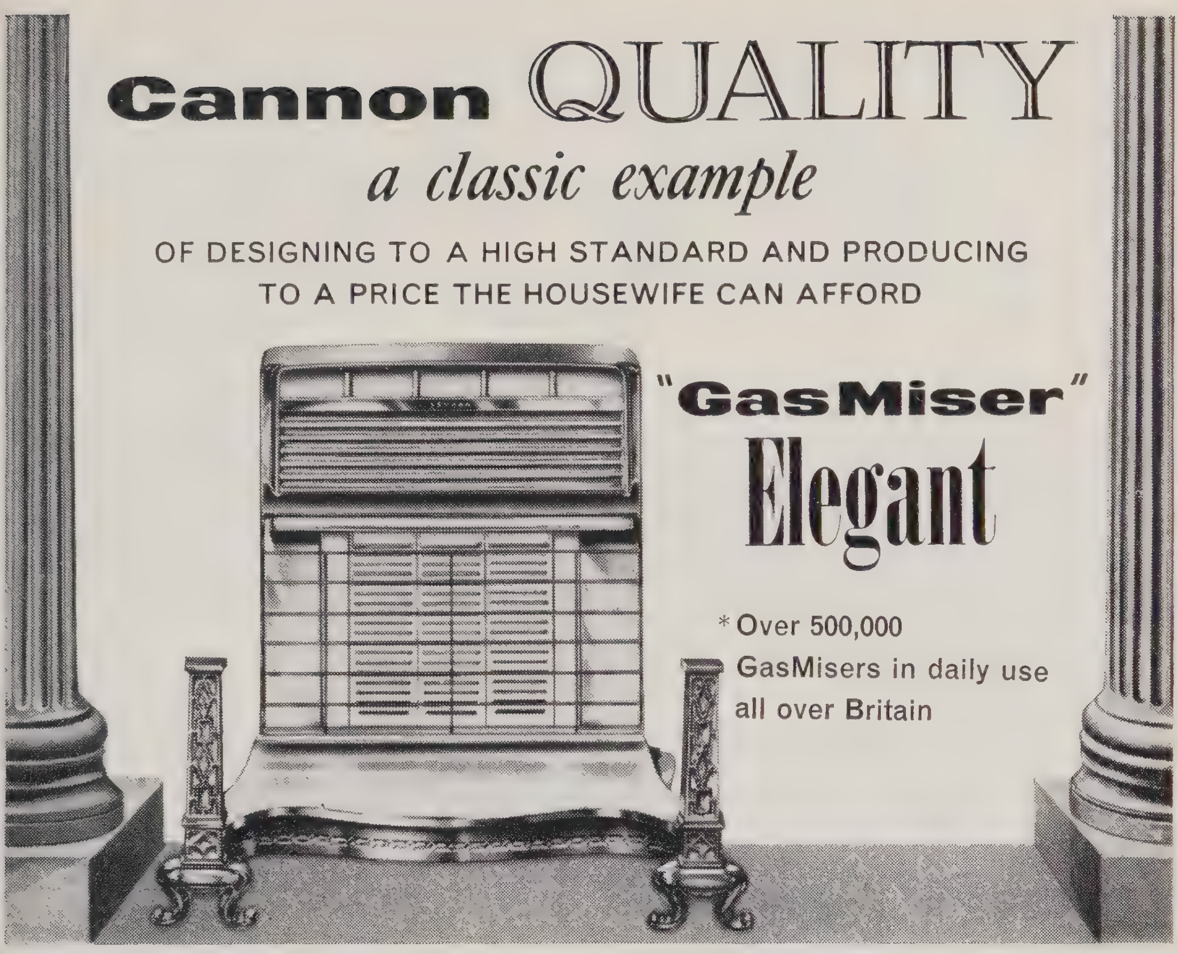
The new boiler, the Potterton 30+3, provides all domestic hot water and will serve up to four average-size radiators (80 to 100 sq. ft. of radiating surface), plus releasing sufficient heat to warm the kitchen—hence its name. Usually, with automatic boilers, it is necessary to have a radiator to do this. Thirty thousand B.t.u./h. heats the water and 3,000 B.t.u./h. is heat into the air.

Running costs will be competitive with operating a solid fuel boiler of comparable size.

Priced at £49, including all controls, it will be possible to install a Potterton 30+3 from £75, where there is a straightforward change over from solid fuel. With the no-deposit loan scheme arranged by Gas Boards, this would mean a payment of 9s. 4d. a week over four years.

A water thermostat with a wide differential, which prevents excessive "on-off" operation of the boiler, also has "Warm", "Normal" and "Hot" settings, from 140°F. to 180°F. In the same housing, there are other controls, including a special thermo-electric flame failure safety device.

Compact in size—the 30+3 is only 12 in. wide and 24 in. high—it is attractively styled in white and pale grey. There is a removable front panel for easy access to the controls and the height of the flow and return water-pipe connections is arranged so that a change over will involve the minimum of pipework alteration. Maintenance is both easy and speedy.



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20th - 23rd OCTOBER, 1964
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Exhibition plan and full details from: Exhibition Organizer, N.S.C.A.
Field House, Breams Buildings, London, E.C.4.

The Victor 2, Gas-Fired Incinerator

A larger smokeless incinerator which will effectively destroy bigger loads of placenta, hospital dressings, ward waste, etc. and known as the Victor 2, 1–2 cu. ft. Incinerator, is listed by the Gas Council as a recommended appliance complying with the Clean Air Act.

To operate the incinerator, a foot pedal is depressed which opens the leading door to take the waste material, leaving both hands of the operator free, a dial is set to the required burning period and the incinerator then carries on automatically.

There is an automatic cut-off when the burning period has been completed. If another load is to be added during a burning period, (when the incinerator is locked and unopenable), two safeguarding actions take place before it can be reloaded.

The timing knob is moved down to "off", which action turns off the main burner and unlocks the interlock to allow the loading door to open. On opening the loading door, an interconnected rear flue aperture flap diverts the smoke into the smoke burner chamber which prevents emission of smoke into the room or the atmosphere.

After reloading, the timing knob is moved upwards to the appropriate burning period required and thereafter, the main burner is automatically cut off. The main combustion chamber is vented to a second burning chamber—the smoke burner chamber, where air turbulence draws the smoke into the intense gas flame heat burns the actual smoke.

The Victor is manufactured by Victor Products (Wallsend) Ltd.

GAS GOES AHEAD

This booklet outlines the development plans of the industry to 1970. Significantly, it takes the place of a 1960 publication more passively entitled *Gas Looks Ahead.*

The industry's most recent previous estimates had been based upon an expected increase in sales of 3 per cent per annum, but it is now considered that provision should be made for a demand increasing by up to 5 per cent per annum. The main change underlying this sharply rising trend in sales has been the rise in domestic consumption, especially in the use of gas for space heating. The rate of appliance sales indicate that this trend is likely to continue, and even to increase.

The industry is now in a position to extend its capacity at moderate cost. The new processes which are being introduced are lower both in capital cost and in running expenses. They are also processes for which the plant can be commissioned at relatively short notice if it should transpire that the demand for gas increases at a rate even greater than expected. Imports of natural gas from the Sahara will begin next year and will provide about 10 per cent of town gas production. Discussions are taking place with the Dutch authorities to see whether natural gas could be obtained from the vast resources in Holland, and surveys are being carried out in the North Sea.

"*Air Pollution*" is the title of a booklet of 32 quarto pages issued by Edgar Allen & Co. Ltd. (Imperial Steel Works, Sheffield) and written by Dr. A. D. Merriman, G.C., O.B.E. It is concerned mainly with the particles that constitute air pollution, their nature, sizes and behaviour, and goes on with a technical description of the various methods of removing them from flue gases. It contains much interesting and practical information and is more in the nature of a miniature text-book than an industrial brochure.

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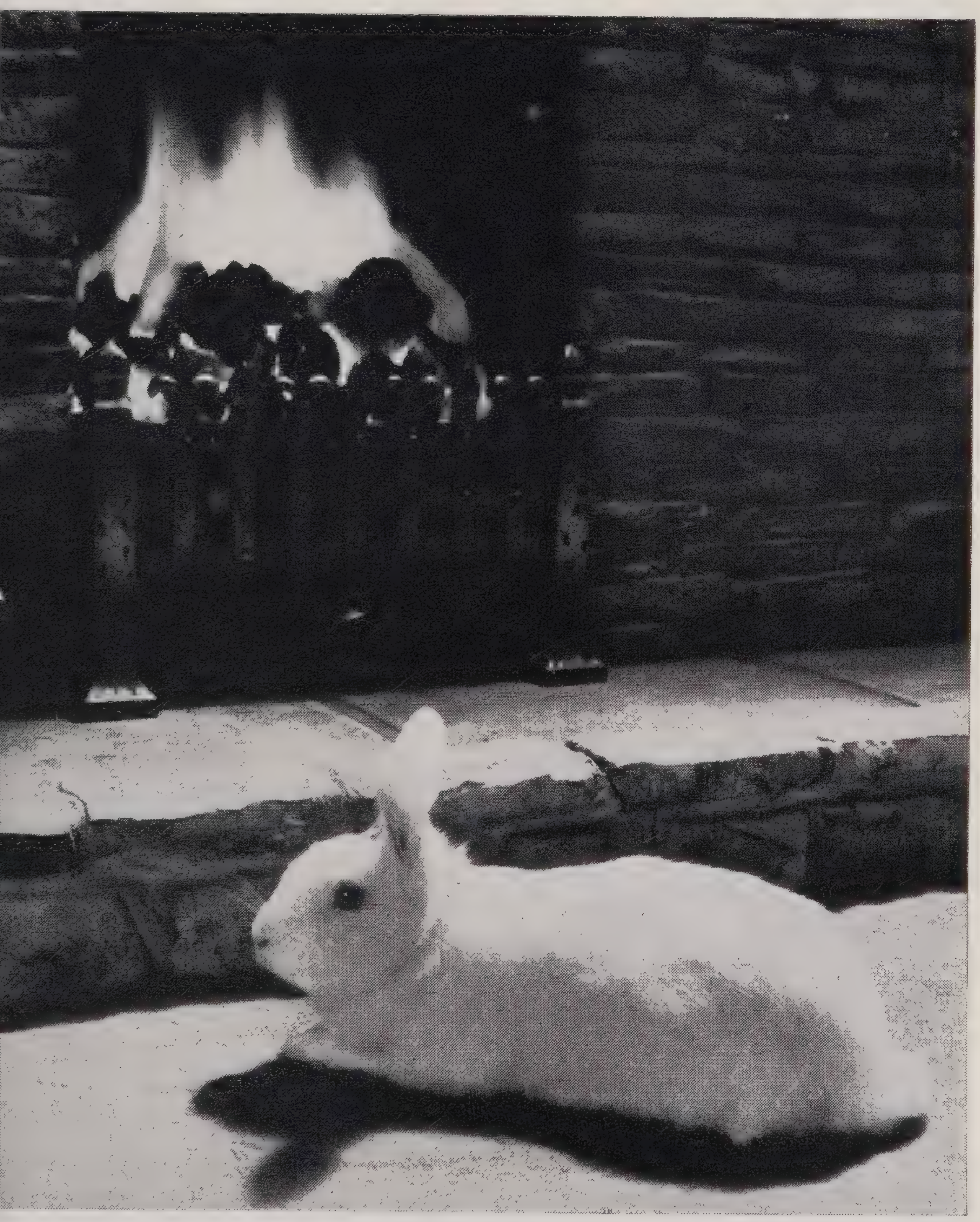

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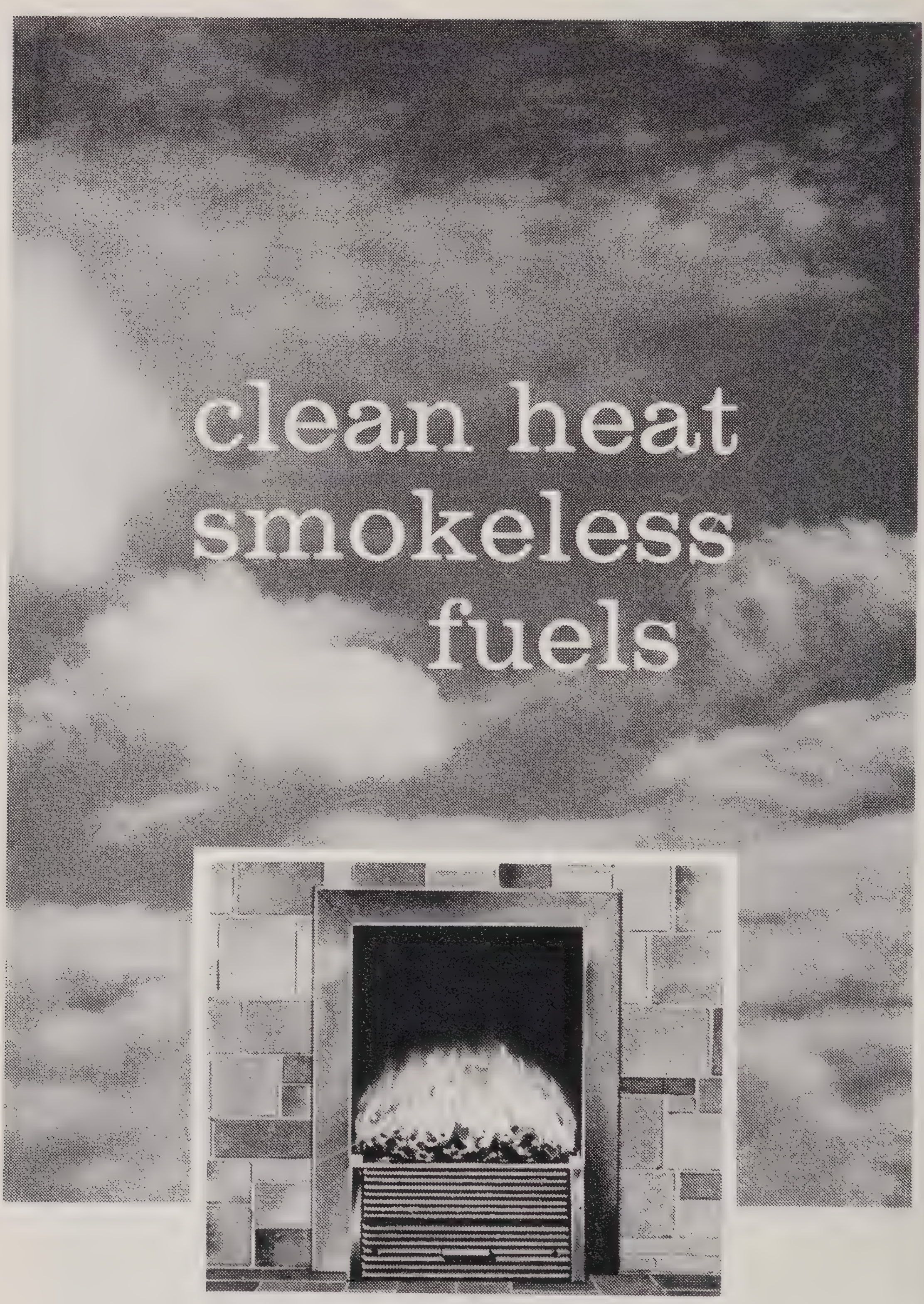

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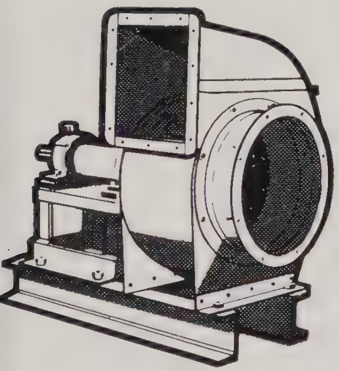

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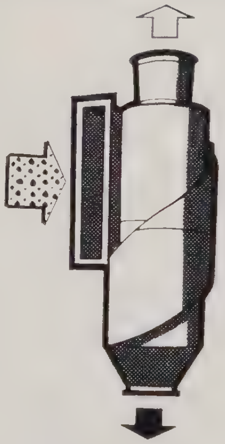
'Tornado' induced draught fans for regulated positive draught, ensure complete combustion of all grades of fuel for efficient and economical steam raising. Ask for Publication 3/SA.



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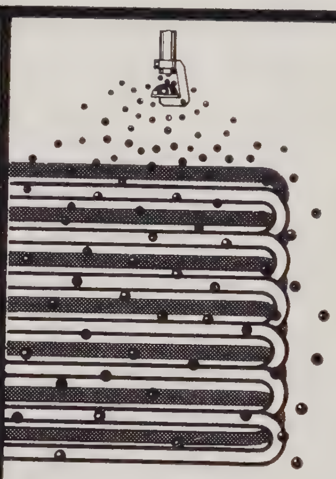

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'Keith Blackman-Broman Ekstrom' shot cleaning promotes continuous maximum heat transfer for boiler, economiser and preheater tubes, irrespective of fuel and without shutting down or damping back. Ask for Publication 35/SA.

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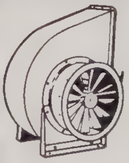

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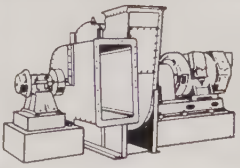

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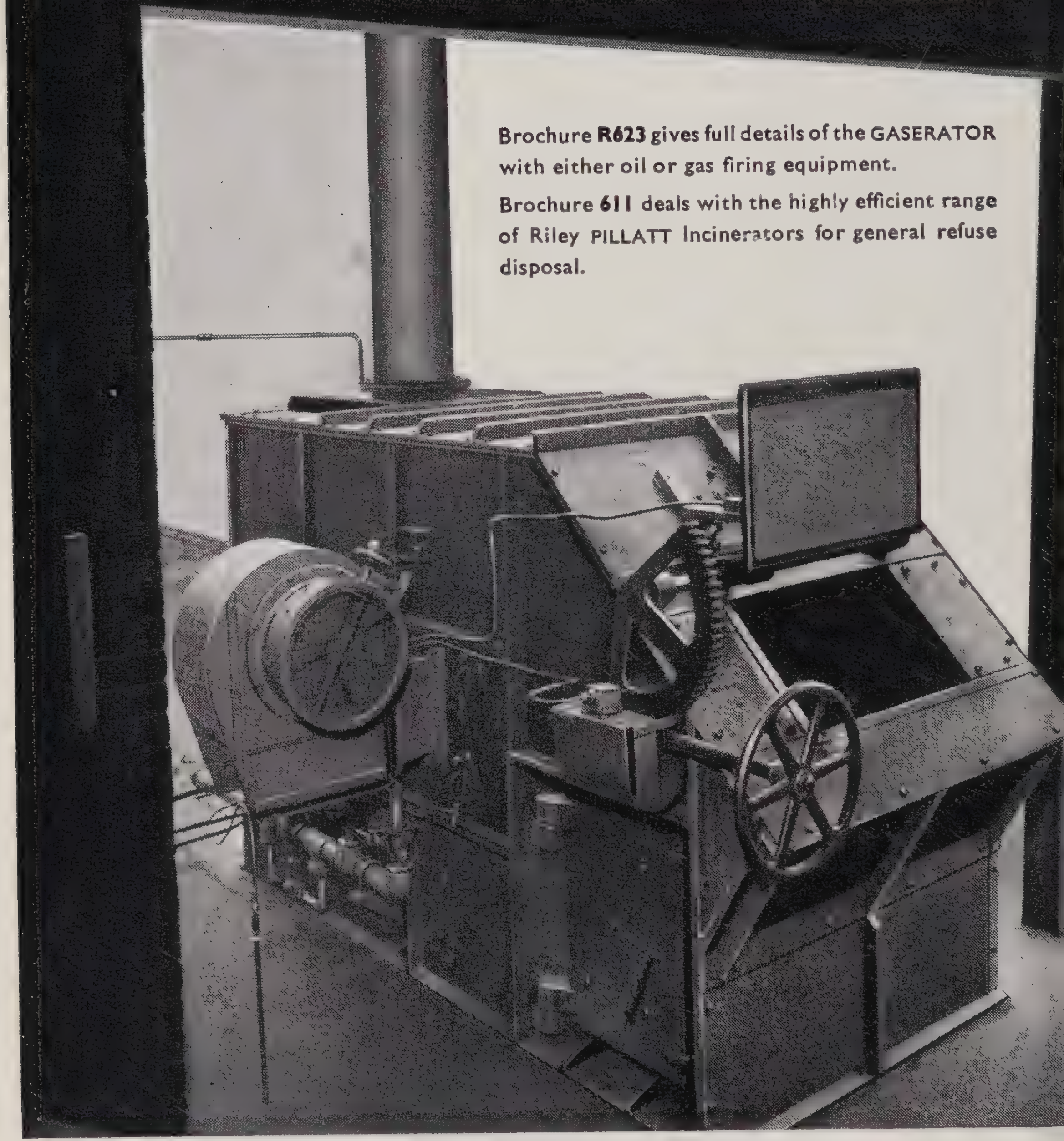

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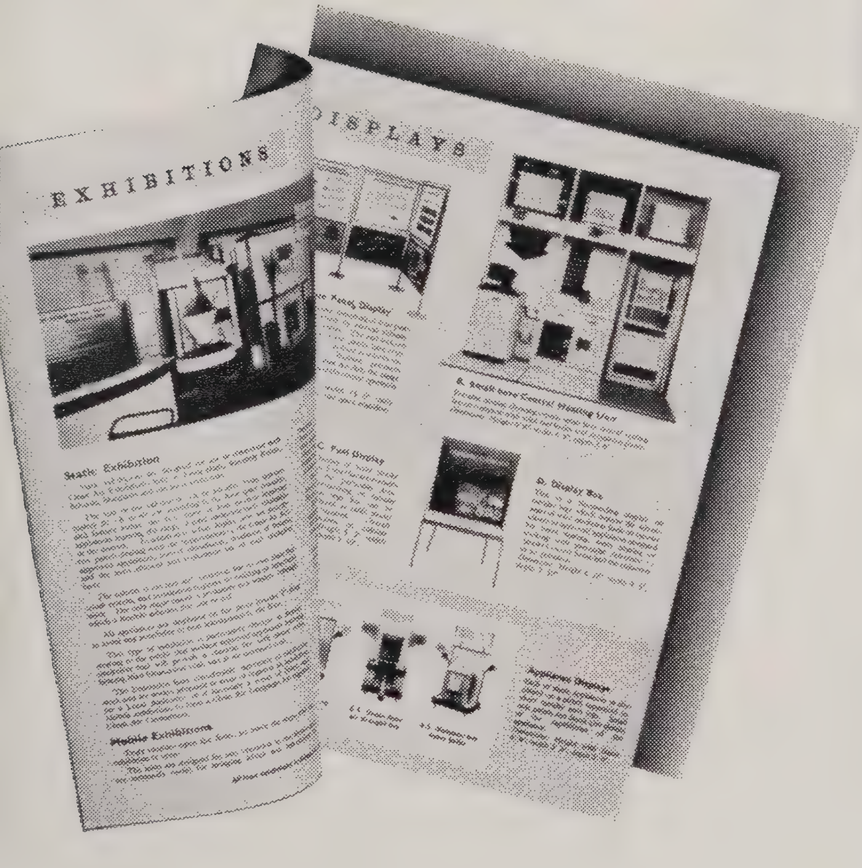
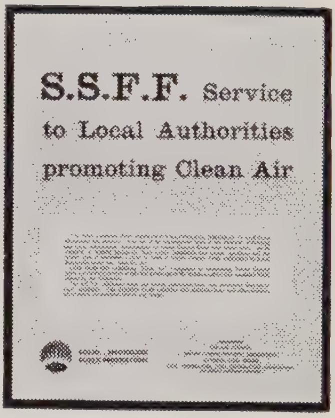


Local Authorities organising "Clean Air" campaigns or establishing Smoke Control Areas are cordially invited to take full advantage of the technical advice and assistance freely offered by the Solid Smokeless Fuels Federation. The Federation is always prepared to assist or organise an exhibition, or if required a series of static and mobile exhibitions to form a "Clean Air" campaign for regional Clean Air committees. Services of this kind have been provided for Local Authorities up and down the country.



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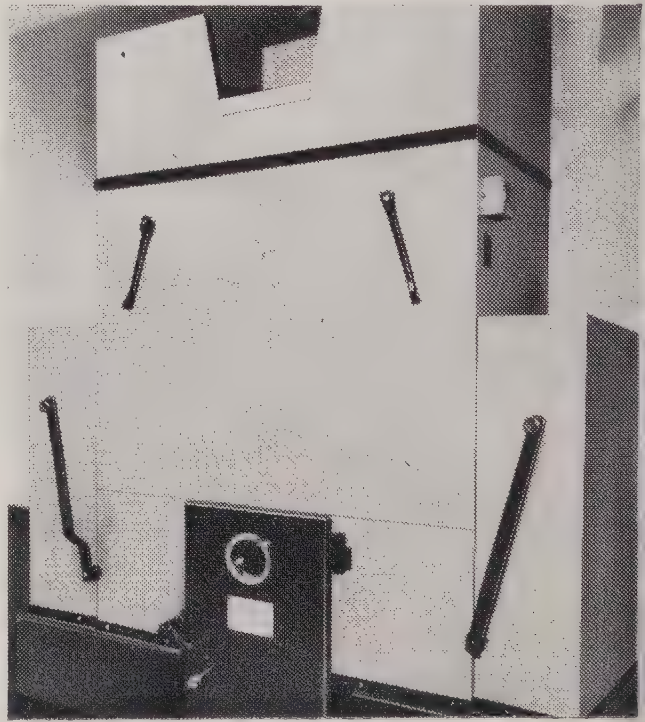

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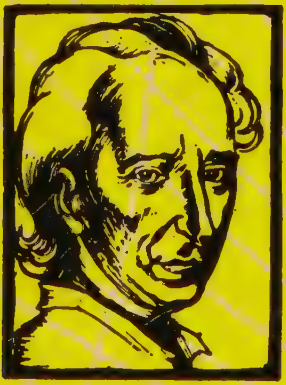

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In this Issue

Sir Keith Joseph on Clean Air ✶ Air Pollution and Bronchitis
Gas and Electricity Today and Tomorrow ✶ Automatic Smokeless Coal Boiler
Progress in the Potteries ✶ Oil Heaters for Smoke Control Areas

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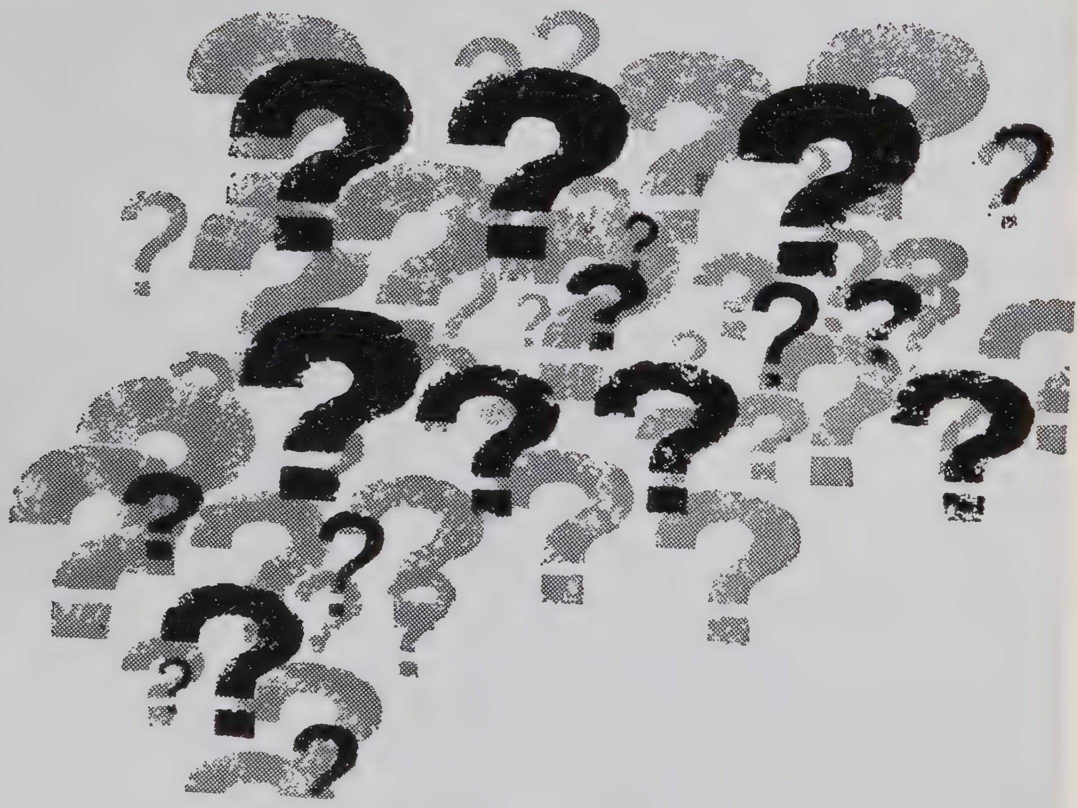

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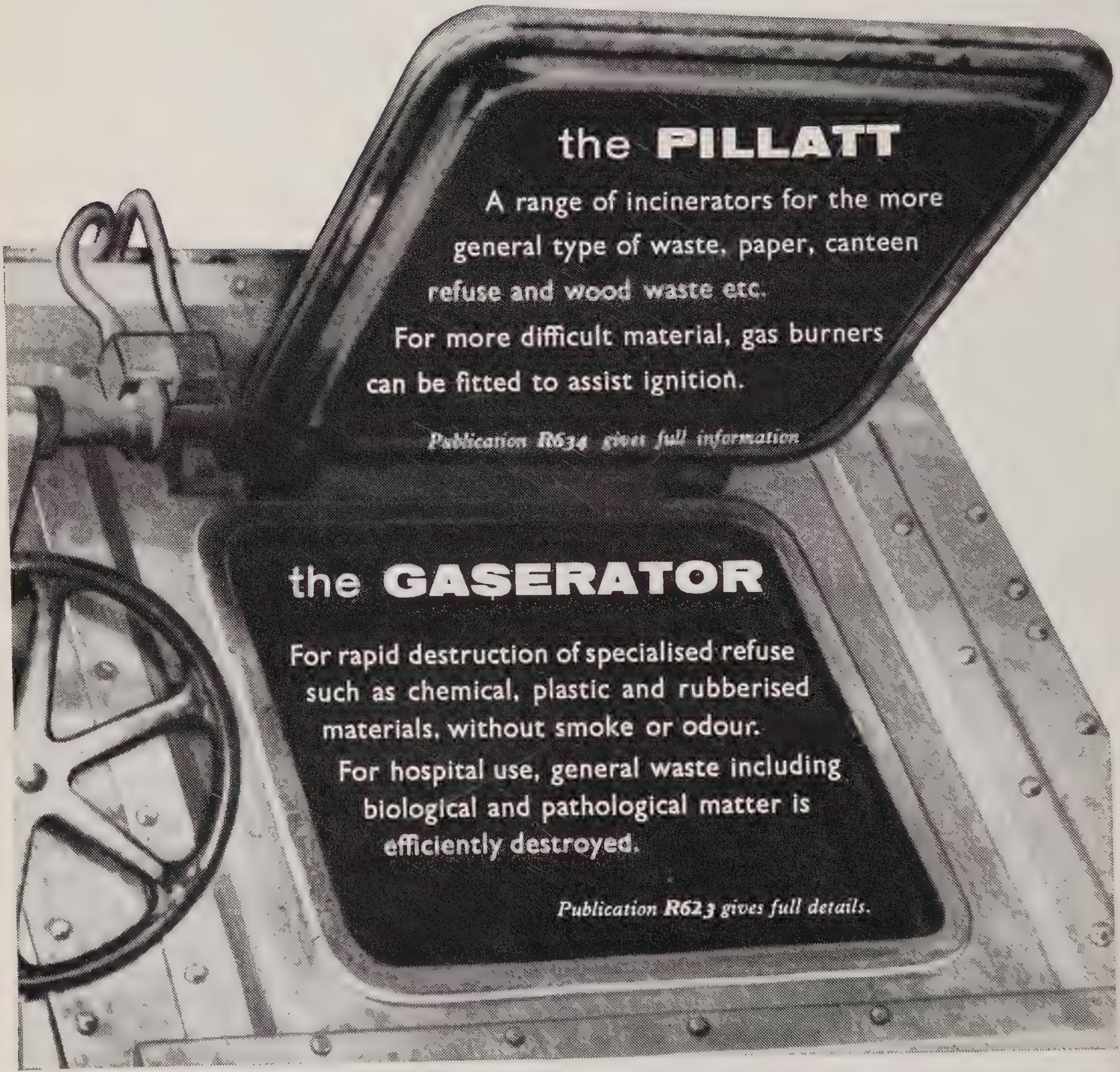

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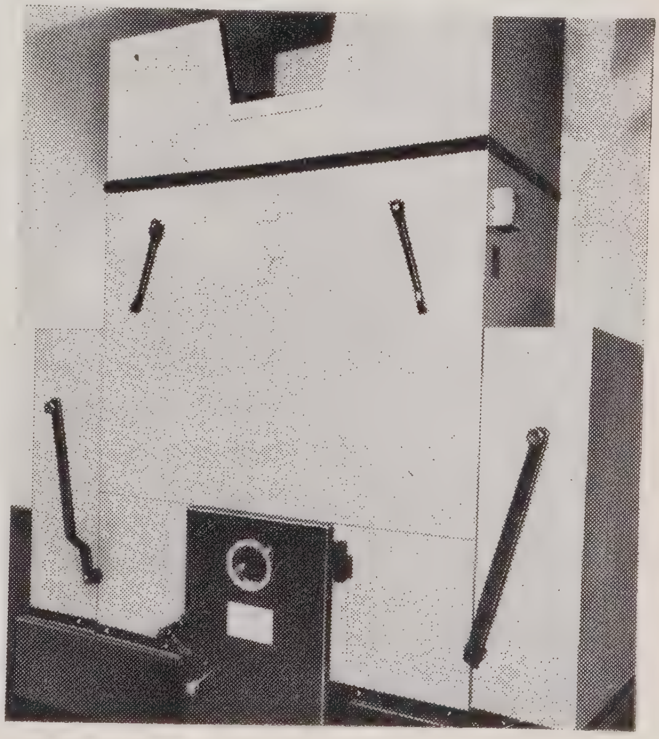

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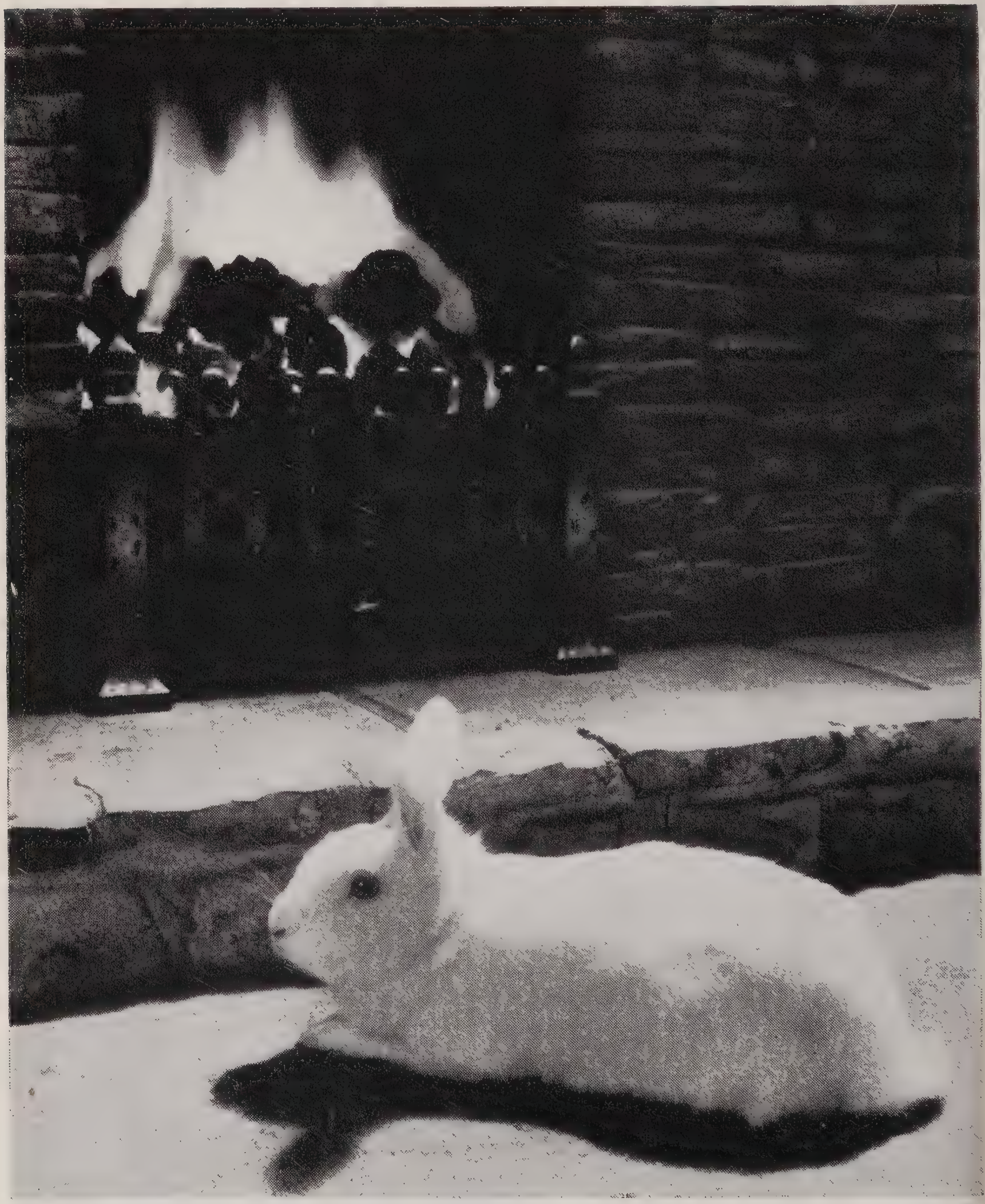

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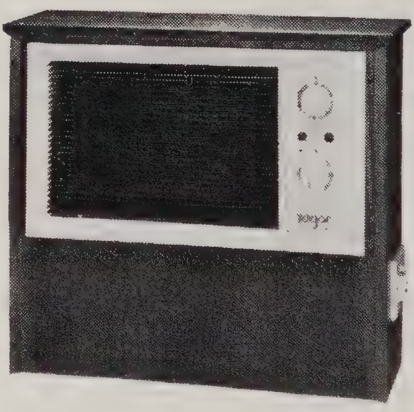

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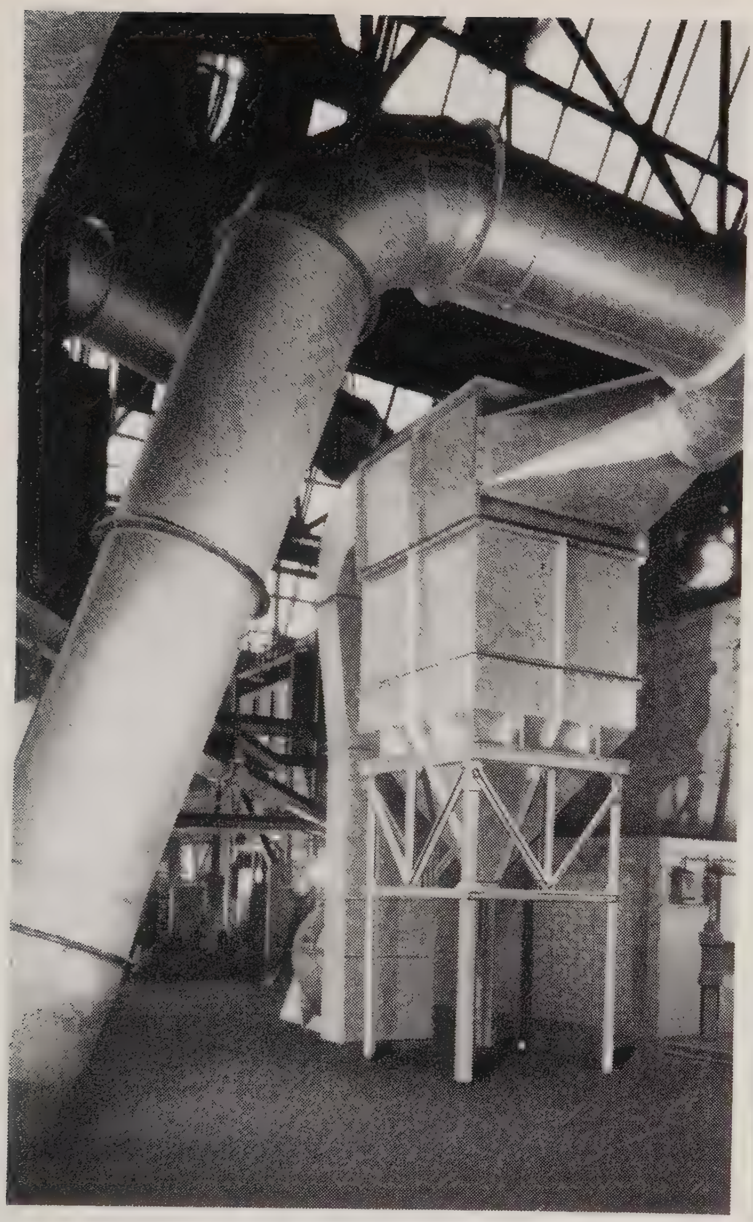

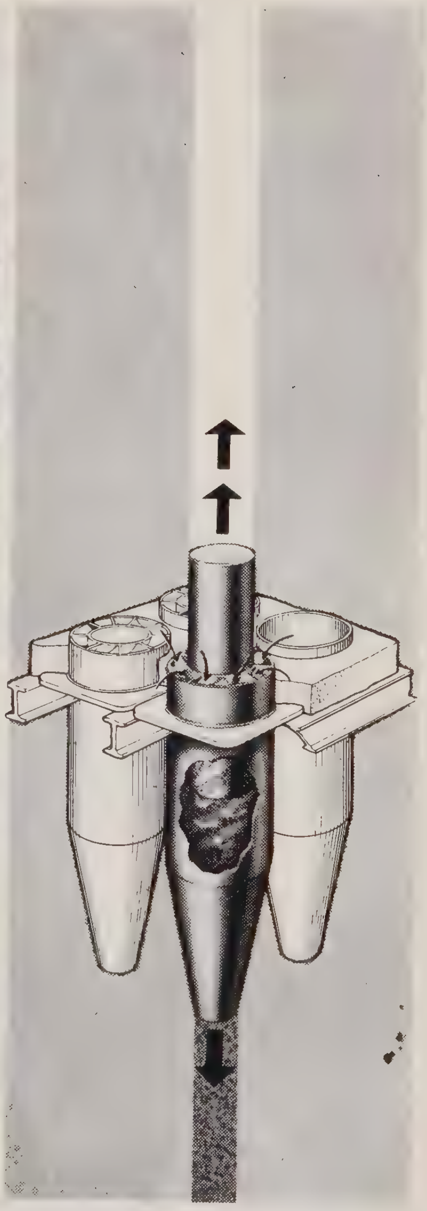

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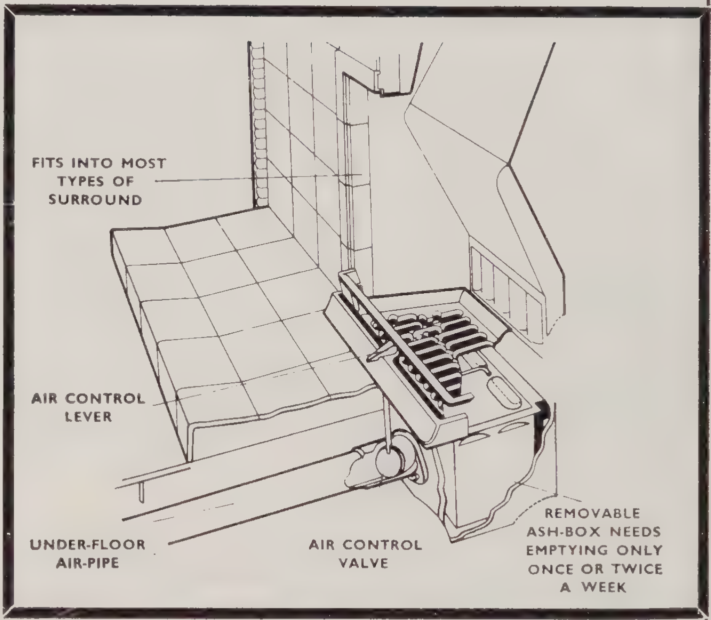
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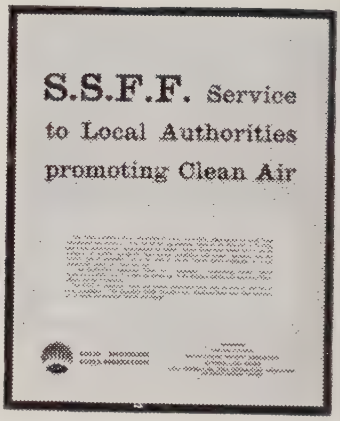

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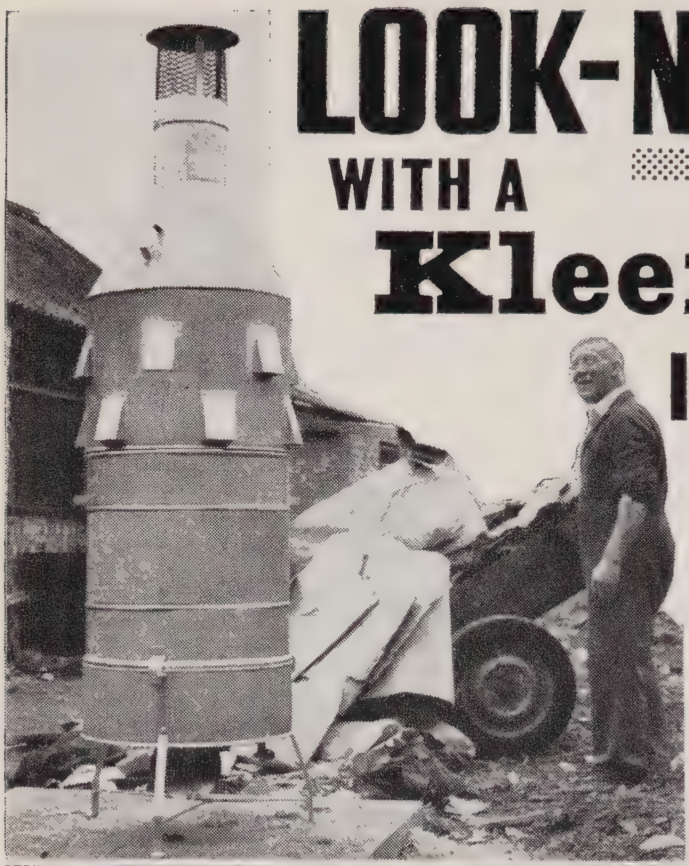

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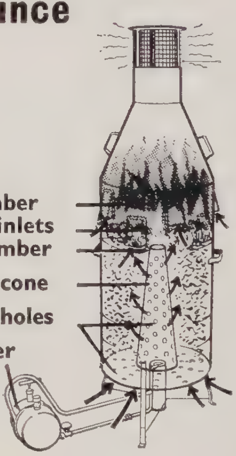

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Ships, towers, domes, theatres and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

The Ministers

ALTHOUGH from the nature of things it could not dispel all anxieties, the speech given by Sir Keith Joseph at the Society's annual meeting was received with genuine appreciation. It is reported in full in this issue and we commend its close reading by those who were not fortunate enough to hear it. Now, we are pleased to be able to announce that (all being well) the Minister of Power, the Rt. Hon. F. J. Erroll, M.P., has accepted the Council's invitation to speak at and to open the Society's annual conference and exhibition at Harrogate on October 20. The programme for the conference has now been completed and it will be found to be of exceptional importance and interest. Although the industrial side of the problem is by no means being neglected—Dr. Carter will see to that in his Des Voeux Memorial Lecture—special emphasis is naturally being given on this occasion to the domestic aspects of the problem. The Thursday morning session, at which four of the top people from the major fuel industries are to speak, will be an especially noteworthy occasion.

The Uncertainty

There is of course one vexatious uncertainty about the conference—the date of the general election. We are possibly fortunate in meeting later in the month than is usual, as most of the prophecies about the election date put it earlier. But we could be unlucky. The possibility of having to attempt to hold a conference and exhibition during election week is as appalling a prospect as attempting at this late stage to change the date. Earlier this year we had had fears that there would be a spring election that would clash with our April meeting. We know that we are concerned with only one, relatively small, event, but there must be scores or hundreds of other events for which forward planning is essential, similarly affected. This archaic guessing game may be good fun politically, but from a business point of view such deliberate uncertainty looks like plain inefficiency.

The Setback in Smoke Control

The encouraging report, in our last issue, of the Society's inquiry into the industrial smoke and grit situation, received a great deal of publicity, and in the present difficult period on the domestic side it was useful to put the spotlight on the sector of the Clean Air Act where quiet but excellent progress is being made.

The effects of the changes in smoke control arrangements are now becoming apparent, and our usual table of progress for once makes poor showing. We also record, with regret, a list of local authorities who have deferred or suspended their smoke control schemes. Sir Keith Joseph, we were glad to hear, told us that the tide was showing signs of turning and more orders were now coming in for confirmation. On another page we give an interim report on the response of local authorities to the appeal addressed to them by the Society (for which Sir Keith expressed his appreciation). From this we see that many authorities have not wavered in the implementing of their clean air programmes, and some have even accelerated them. We shall have much more information when, at the Harrogate conference in October, we receive reports on the regional situations.

It is as yet still too early to draw firm conclusions on the ultimate effects of the new dispensation, but it is clear that although it has slowed down progress, it is nothing like as serious as it might have been, and that the outlook for the future is not without promise.

The Diehards

One effect of the changed situation has been to intensify the vociferous minority opposition to clean air that has frequently arisen (or been fomented), especially in the midlands and north. There has even been a report of an "Anti Clean Air Committee" in one town, and in some of the mining areas a deep-rooted conservatism springs to the defence of the open coal fire. But the most astonishing opinion we have seen was an editorial in the *Dundee Courier and Advertiser* of April 16. This newspaper has been waging a violent campaign against clean air for many months, and after the Minister's address to the Society it just could not contain itself. Its comment must be recorded, both for present information and for the record of how some people still thought in the 1960's:

> "Sir Keith Joseph, Minister of Housing, says he believes the public have decided they cannot put up with the 'awful consequences' of the open coal fire any longer.
>
> "But what on earth are the awful consequences?
>
> "What better than the cheery glow of a coal fire on a cold day?
>
> "Contrary to Sir Keith's belief, a great many folk are only too happy to put up with it."

Put into general terms this means simply that if you enjoy doing something the consequences (what on earth are they?) do not matter. In other words, "I'm all right, Jock". A strange doctrine to come from Scotland and to be expressed in a responsible newspaper.

Cancer and Bronchitis

More material has appeared, and is reported on other pages, on the relationship between air pollution and chronic bronchitis, and between air pollution and lung cancer. At a symposium of the Royal Society of Medicine on the medical and epidemiological aspects of air pollution the link with bronchitis seemed to be strengthened, while for lung cancer comparison between Britain and South Africa again indicated environmental factors, possibly including air pollution, at work in the promotion of lung cancer.

At the same time as this international meeting in Wigmore Street there was published a research paper, the conclusions of which we record, by the Tobacco Research Council, on mortality from lung cancer and bronchitis in relation to smoke, sulphur dioxide concentrations, population density and social index. The report is a detailed statistical analysis of considerable interest, and the conclusions that must be noted again indicate the association between air pollution and bronchitis, and cast doubt on an association between air pollution and lung cancer, even though indicating the existence of an association with the other environmental factors considered. It is also stated that the statistical evidence does not confirm the suggestion that the lower mortality in rural areas is due to a later onset of the cigarette smoking habit.

Carbon Dioxide

CO_2 is not usually regarded as an air pollutant, although it is the principal and indeed desirable product of all combustion of carbonaceous fuels. It is a natural constituent of the atmosphere, is essential to plant life and is of course produced in our own lungs and exhaled in our breath. But, with the enormous and increasing amount of fuel being burned all over the globe, the quantity of carbon dioxide being poured into the atmosphere is enormous. And it is building up. According to a report on the subject by the Conservation Foundation in the U.S.A., the carbon dioxide content of the atmosphere has increased from 220 parts per million in 1890 to about 315 parts at present, and it is increasing at a rate of 0·7 p.p.m. each year. This increase represents only about one-half the amount of the gas put into the atmosphere from the combustion of fuel and it is assumed that the remainder is absorbed by the oceans.

The danger to the future is not simply that of living in an atmosphere over-rich in carbon dioxide, but that it will have the effect of raising the temperature of the earth, and that in the not too distant future the average surface temperature of the earth could be increased by as much as 7°C. The report points out that a change even half as great as this would be more than sufficient to cause vast changes in the climates of the earth: "the polar ice caps would almost surely melt, inundating many densely settled coastal areas, including the cities of New York and London . . . many life forms would be annihilated on both land and sea".

It looks grim, but perhaps the fossil fuels will run out in good time, forcing our descendants to depend on nuclear and solar energy.

Burning Coal without Smoke in the Home

The drive for clean air has often been interpreted as a drive against the use of raw coal, especially in the home. As far as the open coal fire is concerned this is emphatically true, but that is all. There is no case against using raw coal in industry because there it can be burned without smoke, and the same criterion should apply to any domestic appliance. For many years there have been efforts to achieve this, notwithstanding the fact that from the nature of the problem it is quite hopeless to attempt to devise a smokeless open coal fire. But with the development in recent years of automatic boilers, ensuring high efficiency and therefore smokeless combustion, it has seemed only a matter of time before a small, domestic type model was evolved.

An important advance appears to have been made with the Stokermatic boiler, which has been developed by Draysley Ltd. in conjunction with the National Coal Board. It is described and illustrated on another page. The Ductair Solid Fuel Unit of Radiation Ltd. was the first in the field and was accepted as an "exempted fireplace" for smoke control order purposes. The new appliance will, we presume, also be accepted, and it has already been approved by the Domestic Solid Fuel Appliances Advisory Council. We understand that another automatic domestic heating boiler, the Centurion, is also coming on to the market from James Hodgkinson (Salford) Ltd.

We welcome these developments because they will further stimulate the fast growing trend to central heating which, whatever fuel is being used, is aiding clean air progress; and also because if coal can be used smokelessly for such purposes the solid smokeless fuel supply situation may be sensibly eased.

A.G.M. Day

April 14 was a successful day for the Society, with a well-attended Annual General Meeting, the address already referred to by the Minister, and, also in the Connaught Rooms, a luncheon attended by 150 members and guests. At the A.G.M. Dr. Albert Parker was re-elected President and Mr. Stanley E. Cohen was re-elected Hon. Treasurer. A resolution amending one of the Society's articles of association was accepted, as was one addressed to the Government. This urged that the Clean Air Act should be amended so that the Exchequer would bear a greater proportion of the cost of conversion of appliances in smoke control areas than is now the case. The resolution was duly submitted to the Ministry of Housing and Local Government, from whom a reply has been received stating that the same proposal has been made from a number of quarters, but that it is not found possible to act upon it.

The New Chairman

The results of the divisional elections to the Executive Council were announced at the annual meeting (for details see the new issue of the *Clean Air Year Book*), and at its first meeting, held the same day, a new Chairman was elected to succeed Dr. J. L. Burn, whose two-year term of office was then completed. The new chairman is Mr. James Goodfellow, who has been a member of the Council since 1947 and Hon. Secretary of the Yorkshire Division since its inception the same year. He is Chief Public Health Inspector for Leeds, and as reported on another page, smoke control there is going exceptionally well. Behind this happy situation there is of course a story of patient, detailed explanation and education—due to a very large degree to the enthusiasm, skill and labours of our new Chairman.

And tribute must be paid to the retiring Chairman, Dr. Burn, whose service and dedication to the cause of clean air goes back for many years, with the Society, on the Beaver Committee, among his medical colleagues, in the north west, and in his own city of Salford.

Traffic Fumes

The idea we have thrown out for the setting up of sizeable areas or "carless zones" to be made completely free of motor traffic in cities and other places where clean air and quiet are needed, has of course difficulties that would call for more effort and determination than are likely to be found. Even the imaginative *Sunday Times* scheme for Leicester Square, commented upon in our last issue, seems unlikely to get the attention it deserves. Now a new idea has been put forward by Lord Esher, in an address to the R.I.B.A., which should attract the close attention and support of all concerned with clean air. Considering the centres of historic cities in particular, Lord Esher concluded that they were not areas from which wheeled traffic could be excluded altogether. He therefore suggested that there should be developed a small, silent, rickshaw type of electric vehicle, perhaps with a maximum speed of 15 m.p.h., which alone would be permitted in the designated areas. There is much merit in this and we hope that it will not be lost. From our own point of view it would give complete freedom in narrow streets from ground level fumes and would not rule out the possibility of emulating, where circumstances permit, those fortunate Swiss towns where motor vehicles are banned altogether.

CHIMNEY HEIGHTS

Certain shortcomings in Section 10 of the Clean Air Act (on Chimney Height), and the opportunities for evasion they provide, were described by Mr. John S. Hodgins in our Winter 1963, issue (p. 153). The Society's Parliamentary and Local Government Committee is studying this matter and would be grateful for any further examples of the Section failing to be as effective as the Act intends.

Stop Press

We regret to have to announce that we have just been informed that because of the uncertainties associated with the General Election in October (see p. 279) the Minister of Power will be unable to be present at the Harrogate Conference.

Sir Keith Joseph on Clean Air

Minister's Address at N.S.C.A. London Meeting

Immediately after the Society's Annual General Meeting in London on April 14, the 300 members and representatives present were privileged to hear an address by the Minister of Housing and Local Government, Sir Keith Joseph, Bt. After asking his audience to introduce themselves by showing hands to indicate whether they were members or officers of local authorities, representatives of industry, individual members, or representatives of the central Government, the Minister spoke as follows.

I CONGRATULATE you, Mr. President, on the very knowledgable audience that you have assembled. It makes a fine opportunity for the Minister responsible to Parliament to review where we stand. Of course where we are today owes a very great deal to the opinion-forming, the opinion-leading, that this Society has done and is doing. The first thing I would like to say is to pay a tribute to the officers and members of this Society for the always constructive leadership of opinion that has been provided. As I shall bring out in what I am going to say, we have gone a long way, but we still have a long way to go, and I am sure that in the future as in the past and the present, your Society will make a very significant contribution. And that reminds me to thank you for the wise and far-sighted appeal that I find in your latest issue of *Smokeless Air*, from your Executive Council addressed to local authorities, urging that the momentum of the clean air programme should be maintained and indeed increased despite the technological changes of which we are all aware. Certainly I will do my very best, and the central Government will do its very best, to encourage local authorities in the way you suggest.

I think the most useful thing I can do is to talk briefly about where we stand, firstly in the industrial field and then domestically. Industrially I am sure that the country as a whole does not yet realize quite how much has already been achieved. When Lord Hastings, the Joint Parliamentary Secretary to my Department, opened your Society's Annual Conference last October in Scarborough—and I do most heartily endorse what he then said about the admirable principle of prudent tolerance underlying the Alkali Act—he remarked that this system had enabled the protection of the public to be carried out without stifling the enterprise and initiative on which our society, forced as we are to depend on overseas trade, must rely for its progress. Nevertheless it is understandable that our achievements are not always realized since we don't often enough proclaim how much is going on and how much is being done to clean the air from industrial smoke and grit.

It is understandable that householders should often complain. I get a great stream of complaints from householders who are often having to suffer some inconvenience on being required to change over to smokeless fuels themselves and write to complain. Why, they say, should they be pestered in this way when industrial smoke is still pouring out into the air? They naturally resent what they think is the immunity of a neighbouring industrial maker of smoke. I was going to say this anyway, but it so happens that a kind gentleman called Mr. G. Nicholson, writing from Teddington, Middlesex, and getting his letter with rare marksmanship simultaneously into both the *Times* and the *Guardian* this morning, has made my case. I expect most of you have seen the letter. It is a cry of outrage about the progress of clean air, quoting the electric power stations and sprawling gas works scattered around the banks of the Thames from Battersea down river "belching smoke and smell 24 hours a day". It is a first class letter. "Up river at Kingston-on-Thames, twin stacks at the power station point skywards like giant cigarettes stood on end." It is a very effective letter. But mercifully it is totally misconceived and I hope that some effective answer will be sent so that the readers of these two great newspapers will be given a more balanced picture. The fact is, as I am sure everybody in this room knows, that power stations produce very little smoke indeed. What one sees coming out of chimneys is nearly all steam. I don't blame citizens for not being able to understand this; it is our fault for not making our own progress more clear to them. Of course it is true that there are still some gas works of the older type which do produce a certain amount of smoke, but these are likely because of the technological change in gas-making to be replaced by smokeless gas production over the next few years. The fact is, and I hope Mr. Nicholson will hear of this—I think perhaps I ought to write to him myself—that the source of smoke in London is the domestic chimney.

And I think also we need to bring home to the public and to remind ourselves what immense technical problems are involved in smoke and grit arrestment from the larger and more difficult processes. We cannot simply close works that make smoke and emit grit. Our production and our national trade, our standards of living for a rising population, force us to compete and to innovate across as wide an industrial front as possible. The job of the Alkali Inspectorate is to decide what measures of control are reasonably practicable and to see that these measures are adopted. I doubt if it has really quite sunk in what vast expenditure is being incurred by industry on research into air pollution problems and on the installation of arrestment plant, for most of which there is absolutely no financial return in terms of either a new product or by-product or in terms of more efficient production.

These are social contributions made to the healthy environment by industry as a result of the basic statutes and the pressure of the Alkali Inspectorate and of informed public opinion led by your Society. The capital of running costs of these plants are largely a direct charge on production. Let me give you some examples. £3,000,000 has been spent on arrestment plant for a single steel works, and in other cases sums of £1.000,000 and more have been spent on individual projects. It is the measure of success of our Alkali Inspectorate in exercising this concept of prudent tolerance that industry as a whole co-operates very readily in the spending of such large amounts for this purpose without the Inspectorate having, except in the rarest case, even to consider using their powers of legal enforcement.

What is especially encouraging is the rate at which this effort and expenditure seems to be paying off in terms of cleaning the air. I have been most interested to read in the Spring edition of *Smokeless Air* the results of your recent survey among local authorities. Your conclusion from this was that since 1956 industrial smoke emissions have been reduced by half and industrial dust and grit emission by two-fifths. These reductions appear to be corroborated by data on smoke emission from the burning of coal which appeared in a recent survey by the D.S.I.R.

The contribution of industry to the reduction in smoke, grit and dust pollution is clearly a very important one and, although over this eight year period much has been achieved in consequence of the industrial provisions of the Clean Air Act, that part of industry giving rise to the most difficult problems has continued to be controlled under the twin concepts of best practical means and prudent tolerance embodied in the Alkali Act. Another aspect of industrial air pollution which I feel should be better understood is the enormous scale of increase in fuel consumption and in the production of certain materials. A few figures may give some idea of the scale. In 1938 the throughput of crude and processed oils in Great Britain was 2½ million tons, by 1963 the throughput was 53 million, from 2½ to 53 million tons; the sintering of iron ores for iron and steel during the same period, moved up nine times, from just under 2 million to almost 18 million tons; while steel production has doubled between 1938 and 1963, from 10½ to 22½ million tons. The consumption of coal and coke in electricity generating stations has moved up from 15 million tons in 1938 to 68 million tons, 4½ times as much, in 1963.

All these industries and many others give rise to great problems of smoke and fume arrestment, and yet, during these periods of tremendous, really massive, expansion, enlargement and progress, there has been no general, and certainly no proportional increase, in the incidence of offence caused by industry in the realm of air pollution. Complaint in no way has grown in proportion to the increases in production just quoted, but of course the increasing awareness of air pollution has brought to my desk, and to the desks of many other elected representatives, increasing complaints which are in fact a sign of progress. At a time when society accepted foul air complaints were bound to be far fewer. We must expect that as we are still more successful the residual of foul air will offend even more an enlightened and awakened public opinion. This indeed helps us in our campaign.

Now the last impression I want to give is that we consider the whole industrial house to be perfectly in order as regards emissions to the air. There remain a number of thoroughly intractable and as yet unresolved problems. There are lime works, for example, metal recovery works, including the burning of scrap cables, and the making of blue bricks. These are just examples, but to our mind they are now isolated problems still to be overcome. There is no longer, as it were, a straight undented line of unquelled emissions. The broad line has been breached across the whole front and there remain, as it were, some pockets of resistance, technically complex, technically intractable, still to be dealt with. And since I am glad to note that there are some industrialists here I think I should also draw another conclusion for the national benefit. We are, I think it is right to say, leading the world in our progress in cleaning the air. Other industrial nations have this problem themselves, and nations newly industrializing will no doubt set high standards for their own industry. Now by our demands on industry we have created in this country a potentially large and already significant export industry in arrestment equipment. I was at the Board of Trade for some months connected with the export drive and I believe that the clean air campaign, and on a rather parallel front the clean river campaign, are breeding two potentially significant export earners for this country. I very much hope that this will continue to be a healthy, beneficial by-product of our work.

And now perhaps, before I go on to the domestic picture, is the time to make a sad reference, which I must do, to something that I think we shall all regret. We are just about now awaiting the next annual report of the Chief Alkali Inspector. It will be the 100th report. It will celebrate the centenary of the great Alkali Act. It will also, alas, mark the last report of the Chief Alkali Inspector, Dr. Carter. I think it is generally accepted that Dr. Carter will have proved a great Chief Alkali Inspector, combining effectiveness with understanding and making his friends widely among local authorities and industry, including those very industrialists whose expenditure he has done so much to expand. It is a mark of the quality of the man that he has been able to do this; it is a mark of his quality also that his annual reports are regarded as sources of great interest and great enlightenment even in the complex and esoteric chemical technology world. I am sure his final report—and I as Minister very much regret that it is to be his final report—will be as trenchant, as lucid, and as hard hitting as all his previous reports have been.

The Domestic Front

Let me now turn from the industrial to the domestic front. Here, as we all know, and I need spend little time upon it, the basic assumptions on which the Beaver Committee worked and the Clean Air Act was based have suddenly changed. Of course the Beaver Committee realized that soft gas coke would not inevitably be permanently available in unending quantities, but it did think that we should have some years on which we could depend on an expanding supply. As we all know, recent technological changes, the shifting of the gas industry from coal carbonization on to conversion from oil, on to gasification of coal direct, and on to imported methane, have all come rather quicker in the aggregate than anybody could have expected. Certainly the conversion prospects from oil to gas have come, I think, unexpectedly fast.

It would be madness for us in the interest of clean air to stand in the way of cheaper gas, which must benefit the consumer and which must benefit our industrial costs. What we have to do is adapt the clean air structure to this new technological development. The grant arrangements have therefore been changed. Future smoke control areas will be free to choose, for grant, from the remaining smokeless fuels, that is to say from gas, from electricity (subject to what I am going to say in a few moments), from oil, from underfloor draught grates and from hard coke burnt in the openable stove. This still gives to the domestic consumer a wide range of choice, and of course, if in any area the local fuel suppliers say that soft gas coke is available for new smokeless zones, then to that extent and in that area grants will be available for the improved open grate as before. The reasonably necessary expenditure for all these sorts of equipment will be grant aided and we are also making a number of necessary changes to take account of this technological revolution. In a Bill that is now I am glad to say through the House of Commons, at midnight last night, after 98 hours in total of discussion, and which now goes to the House of Lords, a number of changes of importance to clean air have been made. First of all, houses built since the Clean Air Act, but before the passing of the Housing Bill, and which have been equipped with improved open grates in areas where soft coke will not be available, will rank for grant when the change of equipment is carried out to enable them to burn currently available smokeless fuels. Secondly, local authorities are given a grant aid towards the discretion that they have always had to help the individual householder with

The Minister speaking at the Society's Meeting the 30 per cent of the cost that falls upon him. There are also a number of other detailed changes with which I need not bother at this meeting. But there is one awkward thing that I must talk about. I have had to take into account the fact that it would not make sense, at a time when the peak load of electricity is sometimes beyond generating capacity, to encourage by grant aid from the taxpayer and the ratepayer the addition of further burdens on the direct peak. So I have sought power from Parliament in this Bill to exclude from grant nationally, and to allow local authorities to exclude from grant locally, any forms of heating which I decide nationally, or they decide locally, will not have the appropriate fuel available. I must give warning that because of the generating position it is likely that once this Bill becomes law, if it does pass into law, that electricity equipment that makes its call direct upon the generating capacity of the country will probably be excluded from grant. This still of course leaves the thermal storage electric heating equipment available for grant. I think that this is the sensible thing to do.

The result of all this is that the cost to householders and to local authorities of establishing smoke control areas is bound to rise as a result of the changing fuel situation. Of course the new arrangements recognize this, and a very substantial increase in the amount, though not the percentage, of the exchequer contribution has been agreed. The cost to the taxpayer will go up, the cost to the ratepayer inevitably will go up in proportion, though the proportions contributed by the taxpayer and the ratepayer will stay the same. But I cannot believe that this leaves too heavy a burden either on the local authorities or upon individual householders. First of all the local authorities should bear in mind the fact that most of the so-called black areas of the country, or a very large number of them, are in receipt of rate deficiency grant and that this is a contribution from the taxpayer to what may be an increased rate cost. And of course the local authority ratepayer has always only been asked to contribute 30 per cent of the cost of installing the smokeless equipment. Then we turn to the householder himself, who is expected to pay 30 per cent of the cost; 70 per cent being contributed by the taxpayer and ratepayer. It is true that that 30 per cent of the cost will probably rise as the improved open grate becomes less and less the answer, but the householder is still getting, for 30 per cent of its cost, very, very good value for money. He is getting for 30 per cent of its cost an article that will enable him to heat his home smokelessly and will, if he chooses, and according as to how he chooses, give him a combination of convenience and of high heating efficiency which must give him good value for money. I think we must remember that there is after all a great tide of people outside smokeless zones who are voluntarily, because either of convenience or of increased heating efficiency and entirely at their own cost, doing what some people sometimes complain at being asked to do at only a cost of 30 per cent within the smokeless zones. And there remains for those who cannot afford the 30 per cent, the discretionary help that is available from the local authority that has always been available, plus, as I have just told you, the power now given to me by the Bill in front of Parliament for grant aid of 40 per cent to be paid to the local authority towards the discretionary grant that will help individual householders.

So this is the domestic position. I must confess that with all the improvements we have made, and there are a number of smaller ones that I haven't mentioned, we still face the danger of some loss of momentum. This is inevitable when we have to shift the basis on which our campaign has been built. There are still a number of teething and administrative problems to be sorted out, but I am quite sure that these will be cleared up over the next few months and we shall recapture the momentum which I think was encouraging until this change. At the moment, inevitably, the number of new smokeless zones that are coming forward for authorization have fallen, but even now the number is picking up again. And I would remind you, and through you the country, that although we are not increasing the rate of grant we are making a very substantial increase in the amount of grant. This has to be borne in mind, particularly on the day when the Budget is about to be presented.

Finally, I should cover the efforts that the fuel industries have been making to provide for the present and future requirements of clean air, because unless this keeps pace with progress we shall face the same problem again. The gas industry, I am told, is confident that it can meet all the demands for gas, and also the demands of existing smoke control areas for gas coke. The N.C.B. has plans for expansion of production of various types of smokeless fuels and they say they can meet the demand for hard coke wherever it is found. Their plans for the Coventry plant are going ahead, and they aim there to produce 'Homefire', the Board's new smokeless premium fuel, at the rate of 200,000 tons a year during the winter of 1965-66. I am told that two more similar plants will be built ready for production in 1966-67, making a capacity of 600,000 tons in all. If more capacity is called for, the Coal Board will provide other plant in the late 1960's. Then I am told that private concerns making premium smokeless fuels are also planning increased production.

I have no doubt that although the pattern of smokeless fuel production is changing, clean air policy is in no danger of failing. Clean air depends upon public opinion, but improved standards of living are pressing the householder, and particularly the householder's wife, ever to seek more convenient methods of heating the home; and as education bites deeper, pressing also upon the householder to search for value for money in his heating equipment. These are trends that are on our side. I believe that the public generally have come to the conclusion that it can no longer afford to put up with the awful consequences of the open coal fire. Nevertheless we have no right to be complacent. As I go around the country and naturally in the north in particular, I am aware of the enormous difference to the environment that success in our joint efforts can bring. If we are to make a whole new environment of the north,

At the Annual General Meeting. Left to right: Mr. D. R. Clack (Hon. Auditor), Mr. Stanley E. Cohen (Hon. Treasurer), Dr. J. L. Burn (Chairman), Mr. Arnold Marsh (Director), Dr. Albert Parker (President), and Mr. James Goodfellow (Chairman-elect) if we are to improve housing as we are doing, provide adequate schools and universities and build up industry, then it is, as it were, spoiled unless we also make clean air march at least in time with all this other progress. Certainly industry is playing its part, certainly intractable technical problems remain to be solved, certainly local authorities have done much, and I hope that with the changes that are now being made, they will pick up the momentum on the domestic front again, and soon. We have no right to be complacent, but we do have a right to be proud of what has been achieved and what we aim to achieve.

In all this I am deeply aware of the debt that is owed to your Society in its unflagging efforts in this battle. I welcome and value very much indeed what you are doing, and I hope that as your Executive Council has led the way, you all over the country will help me to encourage the progress that we all want.

BOUQUET

Air Pollution Control authorities everywhere are indebted to the National Society for Clean Air of Great Britain for many factual, practical and useful articles in their publications.—*Opening of a column review of a recent issue of "Smokeless Air" in the News Bulletin of the City of New York Department of Air Pollution Control.*

Smoke Doesn't Sell Coal

Lord Robens recently told the Combustion Engineering Association in London that clean air was as important to the National Coal Board as to the Medical Officer of Health of any authority in the country.

"Smoke doesn't sell coal," he said. "I am a great supporter of clean air and all the Board are supporters of clean air. We could have clean air, and our solid fuels could ensure it."

Domestic Smoke at Greenock
(The Council of this Scottish town recently decided to resign from membership of the Society)

AIR POLLUTION AND BRONCHITIS

Findings of New Report

Mortality from Lung Cancer and Bronchitis in Relation to Smoke and Sulphur Dioxide Concentration, Population Density and Society Index. Tobacco Research Council Research Paper No. 7. By S. F. Buck, Ph.D., and D. A. Brown, B.Sc.(Econ.), AGB Research Ltd. Tobacco Research Council, 6-10 Bruton Street, London, W.1.

THIS investigation is based on information on the factors indicated in the title, in different classes of area. Some information on smoking habits is also discussed in relation to these factors.

The report criticizes earlier statistical examinations covering similar ground because of the lack of representative sites for the pollution information. It makes use of the site classification of the National Survey of Air Pollution and uses data from the survey as well as from other sites that could be similarly classified.

The social index for each area was taken as the number of Social Class V (unskilled workers) per 1,000 males aged 15 and over. The information was supplied by the Registrar General from the 1951 census records.

The findings of the investigation can best be reported by quoting in full its own conclusions, which are as follows.

The Conclusions

This investigation has been concerned with the possible relations of mortality from lung cancer and bronchitis to smoke and sulphur dioxide concentrations, population density and a social index. The investigation has not been concerned with other forms of air pollution, such as petrol engine exhausts or diesel engine exhausts, except in so far as these may have contributed to smoke or sulphur dioxide concentrations. Neither were the possible qualitative differences between the smoke concentrations in different areas examined. The scope of the investigation has been limited by the available data to a study of the extent to which differences between the concentrations of smoke and sulphur dioxide respectively in residential districts of different areas could account for differences between these areas in mortality from lung cancer and bronchitis. The investigation has not been concerned with factors, other than cigarette smoking by men, that might be associated with population density and possibly contribute to lung cancer or bronchitis—factors such as opportunities for respiratory infection, exposure to occupational air pollution and the number of motor cars per acre. A social index can take various forms. For the purpose of this study, the social index was defined as the number of men in the area aged 15 and over in the Registrar General's Social Class V (unskilled workers) per 1,000 men in the area in this age group in 1951. Since many factors, like the lung cancer and bronchitis mortality rates, are higher in urban than in rural areas, the procedure adopted was first to see how far the four factors being examined—smoke concentration, sulphur dioxide concentration, population density and the social index—could account for mortality variations between districts within the same type of administrative area. It was then seen how far the associations found in this analysis could also account for the average differences in mortality between the main types of administrative area.

The main conclusions of this investigation are as follows:

1. Lung cancer mortality in administrative districts of England and Wales is not, in general, significantly associated with corresponding smoke or sulphur dioxide concentrations in the

residential areas of these districts.

2. There is a positive association between lung cancer mortality and population density within the different classes of area which is significant and accounts for differences between classes of area in the average mortality ratios.
3. Bronchitis mortality has a significant positive association with smoke and sulphur dioxide concentrations in residential areas and also with social index, where this is measured by the proportion of unskilled workers amongst adult males.
4. The relationship of bronchitis mortality with sulphur dioxide and social index accounts for the differences in the average mortality ratios between classes of area.
5. For lung cancer, current smoking habits in the different administrative districts do not appear to be the factor responsible for the association of lung cancer S.M.R. with population density that was found to exist between districts.
6. For bronchitis, current smoking habits as described by the calculated smoking variates do not account for a significant increase in the percentage of variance in the S.M.R.'s over that explained by sulphur dioxide concentration in the atmosphere.
7. Standardized mortality ratios and death rates for male lung cancer over the past ten years give no indication that the rural death rates are approaching urban rates and thus do not appear to support the hypothesis that the greater death rates in urban as against rural areas are reflected by the later onset of cigarette smoking in rural areas.

Personal

Mr. S. C. Ginn has been appointed Managing Director of the National Industrial Fuel Efficiency Service.

Miss M. R. Schofield, J.P., LL.M., F.I.Hsg., has retired as General Secretary of the Women's Advisory Council on Solid Fuel, and has been succeeded by Mrs. Celia Gimpel, B.A. Formerly in the Government service, Mrs. Gimpel has for the last five years been General Secretary of the National Council of Women of Great Britain.

The University of Newcastle-upon-Tyne has filled the first Chair of Public Health Engineering to be established in a British university. The new post has been taken over by Peter C. G. Isaac. Professor Isaac has been a leader in this field for many years and has an international reputation for the research carried out by himself and his team. He is a member of the NSCA Executive Council as one of the elected representatives of the North-East Division.

Mr. F. L. Waring, Deputy Chairman and Managing Director of the "Coalite" Group of Companies, and Chairman and Managing Director of Duaramis Fuels Ltd., has been elected President of the Association of Chemical and Allied Employers, of which he is the Immediate Past Chairman.

Mutual Smoke Scheme

As forecast some months ago, the Road Haulage Association and Traders Road Transport Association have now started a joint "mutual smoke scheme" whereby members are being provided with printed postcards with which to notify other members when their vehicles are seen on the road emitting excessive exhaust smoke.

The postcards are intended for executives and not commercial drivers, and it is hoped that they will post a card as quickly as possible after seeing a smoking vehicle so that the owners can make a speedy inspection and take remedial action.—*Commercial Motor, March* 20, 1964.

INTERNATIONAL SECTION

Australia

NEW SOUTH WALES CLEAN AIR ACT AND REGULATIONS

We have received a copy of the New South Wales Clean Air Act of 1961, complete with the regulations under the Act which were published in February 1964. In brief, the main principle of the Act and Regulations is to place limits on the quantity of air impurities which industry may discharge to atmosphere in New South Wales, air impurities including not only smoke, dust and solids, but also gases, fumes, mists, odours and radioactive substances.

One of the main provisions of the Act is the licensing of certain scheduled industries. Such industries as chemical, cement, coke or metal works and others similar to those controlled by the British Alkali Act, have to obtain every year licences for varying fees from the New South Wales Health Department, who may require the installation, alteration or repair of control equipment as a condition attached to the issue of a licence. Also approval concerning the proposed site, buildings and processes must be obtained by anyone intending to operate a new scheduled industry.

The most important feature of the legislation however, is that subject to special exemptions, it is an offence for any industry to operate "in such a manner as to cause, permit or allow the emission at the prescribed point of air impurities in excess of the standard of concentration and rate prescribed in respect of such trade, industry, process, fuel burning equipment or industrial plant". These maximum standards of concentrations and rates of emission of pollutants are set out in the Regulations which are to take effect from January 1, 1965. In cases where no standards are set down, occupiers of industrial premises must use "practicable means as may be necessary to prevent or minimise air pollution".

In a Foreword to the Clean Air Act and Regulations, the Minister of Health, Mr. W. F. Sheahan, expresses the hope that New South Wales should be able to avoid the serious air pollution problems that have developed elsewhere and congratulates industry in accepting this legislation which he describes "undoubtedly the most far reaching and comprehensive yet introduced into any country of the world". It recognizes that some pollution is inevitable but need not be a problem if the amount is below a desirable standard. The Minister is aware that in order to achieve the limits set down, industry will have to make sacrifices, to accept considerable costs, and in some cases face almost insurmountable difficulties. He also admits it would be unrealistic to assume that all of the emission limits could be achieved by January 1, 1965, when they become operative.

The Netherlands

AIR POLLUTION AND PUBLIC HEALTH IN ROTTERDAM

The Dutch Committee for Soil, Water and Air, has published a booklet entitled "Air Pollution and Public Health in Rotterdam" by Dr. L. Burema, K. Biersteker and Dr. H. de Graaf, which reports on the investigations made into possible effects of air pollution peaks on human health in that city.

Daily mortality and morbidity data were collected for December 1952, January and February 1959, March 1961 and December 1962. High air pollution concentrations compared with average winter levels existed on January 29, 1959, March 8, 1961, and December 5, 1962. The graphs and tables show that each occasion coincided with small increases in general mortality and hospital admissions of persons over 50 years of age for cardiovascular and respiratory diseases, the most pronounced mortality increases being among persons over the age of 60 from tumours and cardiovascular diseases.

For 1962 a more detailed search was made for data that might support the assumption of a causal relationship with air pollution. It was found that a control population that was exposed to the same weather but less air pollution, was much less affected by mortality and sickness absenteeism.

In 1952, Rotterdam was covered by a dense fog between December 5 and 9, and although London was severely affected at that time, there were no definite effects on Rotterdam. No air pollution measurements were done in 1952, but it is known that the output of atmospheric pollutants and especially of SO_2 was much smaller twelve years ago.

The results of the study seem to indicate that Rotterdam has promoted itself to a level of industrialization and urbanization, where air pollution effects on human health begin to show themselves during abnormal weather at least once every three years.

Japan

PLAN FOR TOKYO

With an impressive cover picture of the future port of Tokyo, to be completed by 1970, the Tokyo Metropolitan Government have sent us a beautifully illustrated and comprehensive news supplement, published in 1963 and entitled "An Outline of the Ten-year Plan for Government of Tokyo".

Faced by excessive concentration of population and of industries, the Tokyo authorities propose to deal with the problems caused by their city's overgrowth and have formulated a plan which they hope to achieve by 1970. One of the proposed measures is the improvement of environmental living conditions and of public facilities. In this connection, it is stated that public nuisances of noise, smoke and river pollution have been a serious problem in years and that "fundamental measures to eliminate such evils are badly required".

NEWS FROM THE U.S.A.

Dr. Luther Terry

Addressing the Women's Forum on National Security on February 4, 1964, the U.S. Surgeon General, Dr. Luther L. Terry endorsed the conclusions of the American report "Smoking and Health" which pointed the way toward individual actions that should be taken to protect health. Health protection however, also depended on actions taken by the entire community and this applied to air pollution which contributed to the occurrence of chronic respiratory diseases. It was very likely that respiratory irritants, regardless of source, had an additive effect on the causation of disease. The fact that smoking was detrimental to good health merited strong emphasis. "What also merits strong emphasis", said Dr. Terry, "is that we should avoid or curtail to the fullest extent possible *all* sources of contaminants, whether they be those which some inhale deliberately as smokers or those which we inhale unavoidably as inhabitants of our contemporary environment".

Federal Grants for Air Pollution Control Programmes

The Division of Air Pollution of the U.S. Department of Health, Education and Welfare have issued a fact sheet with general information about the kind of projects which will be eligible for grant support under the U.S. Clean Air Act which became effective on December 17, 1963. Section 4 of the Act authorizes the Secretary of Health, Education and Welfare to make grants to State and local air pollution control agencies in an amount up to two-thirds of the cost of developing, establishing, or improving programmes for the prevention and control of air pollution, and to intermunicipal or interstate air pollution agencies in an amount up to three-fourths of the cost. The objective of this grant programme is to provide impetus to air pollution prevention but not to provide a substitute for State and local funds, and applications will be considered on the merits of the particular project for which assistance is requested.

Appropriation of authorized grant funds is expected shortly, and 4,400,000 dollars is requested for these purposes in the budget submitted by the U.S. President for the 1965 fiscal year.

Pollution Ruins Nylons

After numerous complaints about disintegration of nylon stockings worn by women on a day last March in the vicinity of Broadway and Wall Street, the New York Department of Air Pollution made exhaustive investigations and found that the cause of the "runs" were the oxides of nitrogen released into the air during blasting operations for a new construction.

High Award for A.P. Chief

The U.S. Public Health Service's highest award, the Distinguished Service Medal, has been given to Vernon G. MacKenzie, Chief of the Service's Division of Air Pollution, in recognition of his work in the field of environmental health.

Anthony J. Celebrezze, Secretary of the U.S. Department of Health, Education, and Welfare, presented the award to Mr. MacKenzie on April 10, at an awards ceremony in Washington, D.C.

The Citation presented with the medal commends Mr. MacKenzie "for his leadership and outstanding achievements in the field of environmental health, particularly his accomplishments in recognition of the problems of air pollution and their solution."

This is the second honour for Mr. MacKenzie in recent months. Last January he was promoted to Assistant Surgeon General in the Commissioned Corps of the Public Health Service, a rank comparable to Brigadier General in the Army.

California Crops Suffer Smog Damage

California's principal cash farm crop—cotton—is experiencing a serious threat from photochemical smog. In 1962 cotton accounted for 324,441,000 dollars in farm income and was the leading income producer of the approximately 200 commercial crops. Reports of cotton leaf blotching and leaf dropping have been reported by University of California farm advisers in the cotton producing regions of the State. Dr. O. Clifton Taylor, assistant horticulturist at the University of California, Riverside, has proved in the laboratory that certain smog components can cause the blotching and dropping effects. Dr. Taylor cited ozone and peroxyacetyl nitrate (PAN). It is expected that further increases in the incidence of smog conditions in California will further increase the potential threat to cotton crops in the affected area.

A second report from the University of California indicates that smog is thought to be the causal factor which has reduced production of crops in the "citrus belt" by 20 to 25 per cent in mature orchards the past 15 years. An ongoing project by industry, agriculture, local governments, and the University of California is attempting to devise economic criteria for measuring smog damage to citrus crops. The project began about three years ago when citrus growers became concerned with lower yields, decreased tree vigor and size, and poor quality of much of the fruit. The project will continue another three years.

Exhaust Emissions

The Automobile Manufacturers Association announced in March that 1967 model passenger cars for sale in California will comply with the state's motor vehicle emissions standards. This marks the culmination of the industry's ten-year effort to develop devices and techniques to abate air pollution from exhaust emissions. The California emission standards allow a maximum of 275 parts per million of hydrocarbons, and 1·5 per cent carbon monoxide.

The association said that no single type of device or method will be employed, but that each separate automaker will adapt and modify developments which emerged from the industry research programme. Currently there are about 175 engine and engine-transmission combinations. Specific techniques to be used on each of these will depend upon engineering features and present exhaust emissions.

California is the only American State which legally sets standards for exhaust emissions. It is expected that other states experiencing problems arising from motor vehicle exhaust emissions will enact similar legislation.

New Film Available

The Division of Air Pollution, U.S. Public Health Service, has available for free showing a new 25-minute 16 mm. film titled "Take a Deep Breath". Originally produced by a Philadelphia, Pennsylvania, television station, the film is a penetrating documentary treatment of the air pollution problems encountered in one of America's largest cities. The film takes a candid look at the pollution problem of a contemporary urban complex, the efforts it has made to control air pollution, and the task remaining to be accomplished. Strong emphasis is given to the health effects of polluted air. The film may be ordered by number MIS-773 from the Communicable Disease Center, Atlanta, Georgia.

NEW SMOKE AND SULPHUR REMOVAL SYSTEM

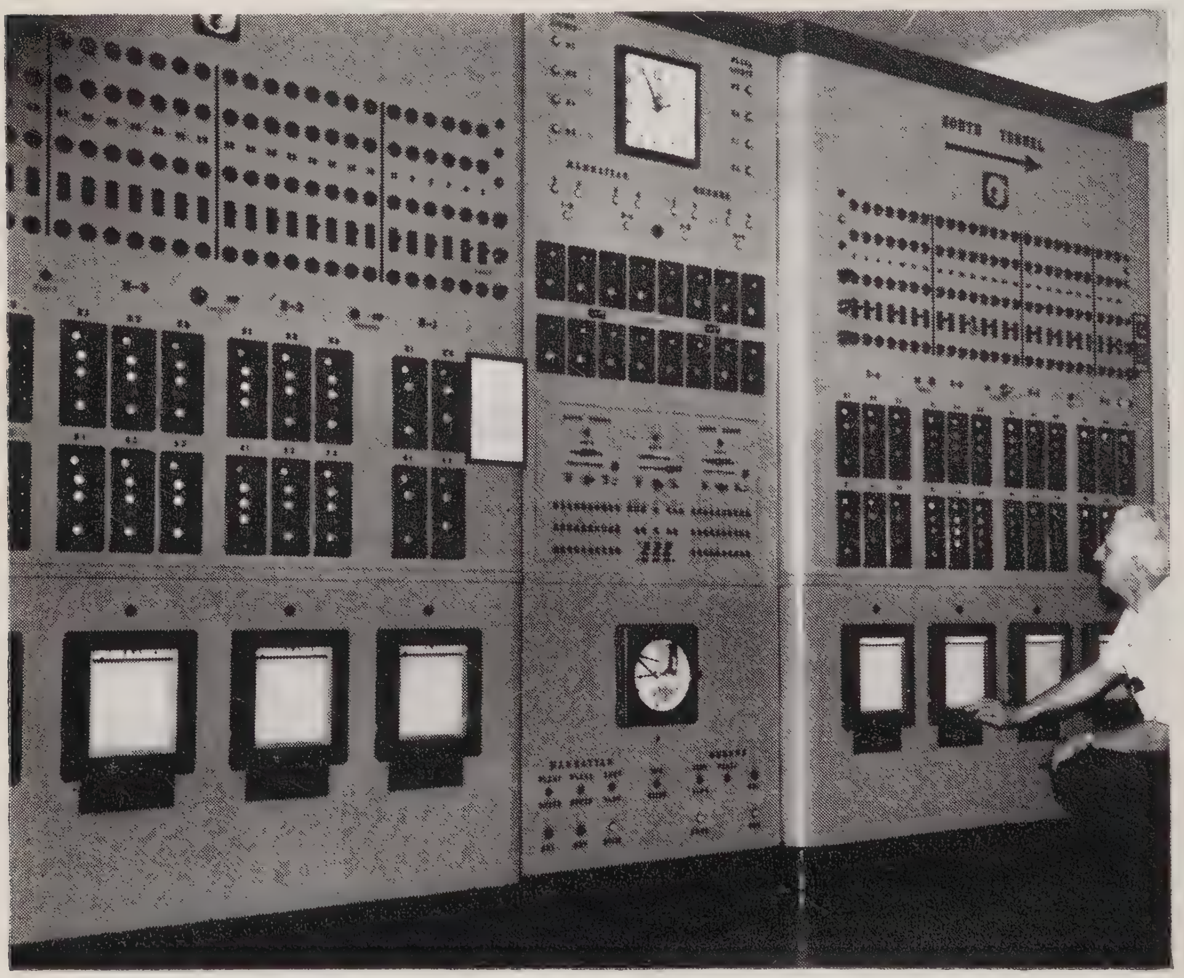
Air/Water Pollution Report, Washington, D.C., May 4, 1964, reports a new system for the removal of both smoke and sulphur from power station flue gases. This was described by Ralph F. Bovier, Vice-President of the Pennsylvania Electric Co., to the American Power Conference in Chicago on April 16. This new system for eliminating solids and most sulphur fumes discharged into the atmosphere while burning high-ash, high-sulphur content bituminous coal in power plant boilers was developed through pilot plant operation over the past two years at the company's Seward station. It not only promises to minimize effectively the stack emission of fly ash and sulphur dioxide—long one of the power industry's most vexing problems—but it also produces sulphuric acid of acceptable qualities and quantities for economic commercial use.

Credit for conceiving the "Sulphur—Smoke Removal System" was given to Jackson & Moreland, consultants for Penelec. It was developed in co-operation with Air Preheater Co., Monsanto Chemical Co., and Research-Cottrell, Inc. Bovier described the system as "basically an adaptation of the contact catalytic process used in the manufacture of sulphuric acid. In this application, the process varies from the conventional acid plant practice since all sulphur values will be removed by the most efficient mist collection system rather than the normal SO_3 absorption tower in which strong H_2SO_4 is circulated."

Economic Feasibility Determined

Bovier reported that in order to determine the economic feasibility of a full-scale commercial system, it was necessary to inventory the component parts of a 1,000,000 kilowatt coal-burning steam electric generating station with and without the Sulphur—Smoke Removal System. The total incremental cost for the acid recovery plant was estimated at $14.5 million, or approximately $14.50 per kilowatt. Based on conservative estimate of 6,000 hours per year operation over life of the station, and with 10 per cent levelized fixed charges, the capital cost of the acid recovery plant was estimated at about 65c per ton of coal burned.

"The pilot plant project," he said, "has proved conclusively that the removal of sulphur dioxide from flue gas by oxidation to the trioxide and condensation as sulphuric acid is functionally practical." He acknowledged that the first application on a full-scale basis "will likely have trials and tribulations. . . . The expected life of the acid equipment, maintenance of this equipment, and its effect on the availability of the boiler have not been developed in the pilot plant. In view of this, it appears advisable to invest in the additional expenses for by-passes so that trouble with the system will not shut down the boiler, a procedure often followed in power plants with new developments of this nature. In view of the apparent economic and operating justification provided by this system, it is expected that these few problems will not deter its orderly acceptance by the industry."



Watching the Carbon Monoxide

This elaborate central control panel for the Queens-Midtown road tunnel, New York, which connects the boroughs of Manhattan and Queens, includes a battery of eight carbon monoxide recorders (by the Leeds and Northrop Company). A concentration of 2·5 or more parts of CO per 10,000 parts of air by volume activates bells and flashing light alarms

Today and Tomorrow

—with Gas and Electricity

We print below extracts from two recent papers reviewing the present and future of the gas and electricity industries—on both of which the clean air movement must rely still more for the continued extension of smoke control areas

Electricity Supply

From a Paper by Professor Sir Ronald Edwards, K.B.E., D.Sc.(Econ.), Chairman, the Electricity Council, at the Annual Conference of the Electrical Development Association at Harrogate, February 18, 1964.

Electricity for Industry

In the next decade we have much to do in developing industrial demand; over the decade 1952-62 sales of electricity to industry have increased by slightly less than 7½ per cent per annum, compared with an increase of slightly more than three per cent in the index of production. The achievement of the economic growth target postulated by N.E.D.C. for the period 1961-66 means now an average annual increase of 6·8 per cent in industrial production during the remainder of the period left to run. At Council Headquarters we calculate that expansion of this order will mean that industry's requirements for electricity will increase by just over nine per cent per annum. About one-half of the total electricity sales to industry is accounted for by:

(1) Chemical and allied trades, including oil refining.
(2) Iron and steel.
(3) Engineering and electrical goods.
(4) Coal mining.

The four industries with the fastest growing consumption are: (*a*) iron and steel; (*b*) chemicals and allied trades; (*c*) food, drink and tobacco; and (*d*) vehicles.

In the steel industry arc furnaces are now being used for the bulk production of steel in addition to the previous more limited use for the production of special steel alloys only. Steel, Peech and Tozer are introducing six arc furnaces each with a capacity of 110 tons, and when this project is complete it will be the world's largest. This consumer's load will then have a simultaneous maximum demand of 150 MW drawn from the grid. Maximum demands up to 70 MW are found in the field of electro-chemical and electro-thermal processes.

There are heartening developments, not only in new industries, but in old, *e.g.* coal mining. Electricity consumption per unit of output in coal mining is nearly 2½ times what it was ten years ago—a tribute to the redevelopment of that industry. Glass melting is again an old industry, but a recent important example in the use of electricity is the co-operative effort between the electricity supply industry and the glass manufacturers to develop improved electric methods in that field. Again, the deposition of finishes of manufactured products is as old as paint, but new processes based on electricity are gaining ground. For example: the electrostatic spray technique is facilitating coating by dry powdered plastic materials.

Following this theme of new developments in old-established industries I might mention the adoption by the pottery industry of electric furnaces for intermittent operation, and now the work which is being done on thermal storage baking ovens designed to operate on off-peak tariffs.

There ought not to be a major industrial process in either a new industry or an old one about which we are not asking ourselves: could it be done better or more economically by an electrical process? And, as the developments—which might well be the result of co-operative research effort—reach fruition, we must have available the skilled effort for selling their use to industrial consumers. We should be training small cadres of skilled technical salesmen on a scale sufficient to enable them to help the general staff in the sale of these new developments. Some older hands have been doing this successfully for years but I am advocating that it should be done more widely and systematically. The electricity industry has much to gain from throwing all its heart and soul into co-operation with other industries in the development of better and cheaper ways of getting work done.

Commercial Sales of Electricity

We are expecting that sales in the commercial sector over the next few years will rise at a slightly higher rate than the 10·3 per cent experienced during the last five years. Here, too, I believe that there is great scope for us vigorously to sell our product to the benefit not merely of our industry but of the community generally. With the enormous increases in new office buildings and the modernising of older ones, it is obvious that there will be increased demand for lighting, water heating and space heating. There are some good loads here for us. Air conditioning is an obvious one. The scope for storage heating is enormous and I am sure that in the commercial field our most relentless attack must be made on this market. Because these premises are normally occupied only during the day, floor warming installations and simple storage heaters are operated in the best possible circumstances.

Think, too, of the drive we should be making to parallel the Government's immense programmes in education and health. I, because of my background, have been particularly interested in the scope that we can find in the educational field. If we can get a good share of the work in the new university and other higher education buildings, we will be demonstrating our product to the age groups 18 to 21, the young men and women who inhabit these buildings. These are young people who in future years will occupy influential positions. What better shop windows could we have?

Domestic Sales

The most dramatic increase in the demand for electricity has come from the ordinary domestic consumer. In the last five years the weather-corrected increase has averaged 12·8 per cent. This is a tremendous spurt forward and has reflected the substantial increase in the standard of living and the decision of the average consumer to improve his home comfort and to give his wife the ever-growing range of power-aided facilities.

Electric cookers are now used by 32 per cent of households, double the proportion just after the war. Over the same period, the proportion of consumers with refrigerators has risen from two per cent to 33 per cent; with washing machines from two per cent to 50 per cent; with water heaters from 10 per cent to 42 per cent.

Forecasting in this field is extremely difficult. The N.E.D.C. objectives imply that consumers' expenditure should increase nearly four per cent per annum in real terms up to 1966, compared with nearly three per cent during the decade 1952-62. How this will affect domestic consumption of electricity is a matter which we have to seek continuously to judge. We are, as you know, mounting a commercial research effort on a much larger scale than hitherto. Trends in ownership level will, in future, be measured regularly and frequently through the AGB 50,000 house audit.

It is most important that we should decide in which domestic fields our best prospects lie, having regard to the facilities we can offer and the costs involved. As you all know, a great deal of the industry's commercial effort recently has been concentrated on the unit plan central heating campaign. By the end of the current heating season over 600,000 block heaters will be in use in domestic and commercial premises—representing an installed load of 1,300 MW supplied at off-peak times.

At this stage, it is not easy to assess how far this method of heating will penetrate the space-heating market, but we are assuming 10 per cent saturation by about 1970, giving a total installed load of underfloor heating, block storage heaters, and storage water heaters of about 7,000 MW.

With the changing shape and intensity of demand in every field in which we work, it is a constant pre-occupation of the planners to assess the aggregate impact on the system as a whole. Everyone in the industry knows the general shape of the load curve and knows that the day-time load is in the shape of a plateau with a dip at mid-day and early afternoon. We have, therefore, been very happy to encourage off-peak storage heating, the efficiency of which could be increased by what is known as the mid-day boost. Recently, a certain amount of concern has been expressed among the public who are buying storage heaters as to whether this mid-day boost will be continued. It would be wrong of us to be selling and encouraging the sale of equipment requiring a mid-day boost unless we were prepared to continue it, and I know of no Area Board which has any other intention. So let me say this: storage heating installations use electricity supplied outside hours of peak demand and many of them receive a boost during the afternoon. I can give you an assurance that the Boards will be able to provide a day-time boost for all present thermal storage heating installations and those purchased in the foreseeable future and that, compared with normal domestic tariffs, the off-peak tariffs available will continue to be advantageous.

Concurrently with the campaign to promote off-peak space-heating should go an intensified drive on water-heating off-peak. Every opportunity ought to be taken to persuade architects and builders to install 50 gal. and 60 gal. hot-water tanks for use with electric water-heating at off-peak.

Again, the Boards must aim at least to retain their share in the market for new cookers and to get a larger share in the market for replacement cookers.

The biggest question mark in the domestic field is, of course, concerned with direct space heating. For some years many people, both inside and outside the industry, have become uneasy about the development of this load. It really involves trying to answer two questions: first, how serious a problem will it present during the period when the industry will have plant margins below the agreed planning levels and, secondly, is it possible to create a price structure which would make the load economic in the long run? I divide these two problems, for to me they are, in fact, very different. In the short run, one must consider the practical limitations of capacity but, in the long run, I take the view that anyone has a right to buy the sort of heating that he likes, provided, and always provided, he meets the proper economic cost. It is, I think, quite wrong to label some loads as good loads and other loads as bad loads in a way that makes it appear that these appellations are almost moral judgments. On the long view, all loads are good loads that people want to place with the industry and for which they are prepared to pay the proper cost.

I do not want here and now to go into the question of the economics of the direct space-heating load, not because it is uninteresting, not because it is unimportant, and not because I have nothing to say on it. The reason why I must leave over discussing this with you for the time being is that for a long time now we have had a Working Party from the whole industry vigorously engaged in studying the characteristics and the economics of the space-heating load. We are expecting to have the report of the Working Party fairly soon, and obviously we must study what they say with great care before making further statements and policy decisions.

Forecasting the future demand for electricity in domestic uses is obviously a hazardous and difficult exercise. It is done, however, in considerable detail and will, in future, be done in even greater detail. We are at present planning for an increase in this field of 10·5 per cent each year up to 1970. This, of course, is a high rate of growth and slightly higher than the growth rate that we are assuming for all electricity. Nevertheless, it does not look too high when compared with the surge forward in the last five years of 12·8 per cent.

The Gas Industry

From a Paper by Sir Henry Jones, M.B.E., Chairman of the Gas Council, to the Royal Society of Arts, London, April 22, 1964.

On May 1, 1949, the boards took over 1,050 gasworks. Today they operate about 300, the sites of the dis-used works often being the points from which gas received at high pressure from a large and efficient works is distributed to consumers in the locality.

Much more than half the gas supplied is made by the carbonization of coal. Some of this comes from coke ovens, but most of it is produced by the gas industry in the process developed by William Murdoch, and used in progressively improved plants ever since; carburetted water gas made from coke and oil and used since 1890 is also extensively supplied, mainly to meet part of the winter peak loads. The gas is produced, cooled, washed, purified and stored at not more than a pound or so per square inch above atmospheric pressure. The heat content of the gas made by the carbonization of coal is only one quarter of that of the coal. The principal by-products of gas production are coke, tar, benzole, ammonia and sulphur.

It was for economic reasons that the industry grew up almost entirely on the use of coal. In a short battle in the 1820's between gas made from coal and from alternative raw materials (then shale oil and fish or whale oil), coal won on costs, and that remained the position almost to the present day. But the economic attractions of coal for carbonization faded during the 1950's (peak coal consumption occurred in 1955-56), and an increasing proportion of gas is now being made from oil, or oil gases; in addition, in this year, 1964, liquid natural gas from North Africa is expected to arrive at Canvey on the Thames.

Two new works have been built, however, for the gasification of coal at high pressure by the well-known Lurgi process, one at Westfield in Scotland and the other at Coleshill in the West Midlands. The Westfield works is using about 215,000 tons of coal a year, and Coleshill, in a full year, will use 316,000 tons. The essential basis of this process is the reaction of coal with steam and oxygen at a pressure of 20 or more atmospheres to make a "lean" gas (*i.e.* with a low calorific value, say, 350 Btu per cubic foot) which is then enriched by one of the petroleum gases propane or butane, and at Coleshill natural gas from North Africa when it becomes available. The process produces quantities of oils and other by-products, which are of significance to the final cost of the town gas made.

The advantages of working at such high pressures are that the reaction and treatment vessels and pipes can be much smaller, taking up comparatively little space, and that the pressure is maintained through the various purification stages—thus, a very important consideration, the manufacture of town gas with a carbon monoxide content of less than five per cent becomes a relatively simple process of chemical engineering. Also, the gas can be transmitted over considerable distances much more cheaply than gas that has to be compressed after manufacture, and production can be concentrated at the most advantageous points. If the system of storage of gas underground is developed in this country gas at high pressure will be required, thus giving a further advantage to pressure processes.

Research, some of it conducted in the Gas Council's own establishments, some of it done elsewhere, has for many years been a vital factor in the progress of the industry. Only examples can be quoted, but they indicate the extent of the part played by research and development in the industry's current success.

Production developments in recent years, following directly from research include:

the SEGAS catalytic cyclic process which at low pressure produces town gas from heavy or light petroleum feedstocks;

the I.C.I. process, developed by Imperial Chemical Industries Ltd., which by catalytic reactions at high pressure produces lean gas continuously from light petroleum distillate;

the Gas Council Gas Recycle Hydrogenator which produces rich gas at high pressure by reaction between lean gas (mostly hydrogen) and light petroleum distillate;

the Gas Council Rich Gas Reformer which produces rich gas from steam and light distillate by catalytic reaction at high pressure.

The utilization of gas has been extended by such developments as:

the convector gas room heater, and the closed combustion chamber room heater, both much more efficient and therefore more economical in use than the older gas fires;

the balanced flue principle applied to gas appliances whereby a single opening in an exterior wall allows air to enter an appliance and products of combustion to pass to the outside of the building;

the SEDUCT and U-DUCT systems of flues for tall buildings which have enabled gas appliances to be installed in blocks of flats and offices where gas would not otherwise have been used.

In addition gas utilization has been improved by extensive research of a more basic nature such as that on catalysts, on flame, already mentioned, and on the combustion characteristics of various types of gases. The industry must be prepared for a future with far-reaching possibilities: gas will be made by novel processes and will not be of traditional composition. The calorific value of gas supplied will probably be higher than is customary today. It is of the utmost importance that the performance of these new types of gas should be understood, and that the behaviour in use of the new range of gases should be completely satisfactory. Current research is designed to ensure that this will be achieved.

Conclusion

In the more immediate future, then, the industry will continue to distribute manufactured gas, and the processes of gas production will follow a pattern which, at least in the early years, is predictable. The old established process of coal carbonization will continue, on a diminishing scale, so long as the existing plants remain serviceable, suitable coal is available at appropriate prices and demand for the solid smokeless fuels made is maintained at levels of quantity and price which make gas production economic. The increasing numbers of smoke control areas will tend to increase the sales of solid smokeless fuels, but the growing popularity of gas for heating may lead to a change in the proportion of solid and gaseous fuels used in these areas. Gas will continue to be made in carburetted water gas plants and cyclic catalytic plants using oil and gas feedstocks as long as they produce gas at sufficiently low cost. All these processes, however, are handicapped by the relatively high content of carbon monoxide in the gas made.

The new processes, based on the steam reforming of light petroleum distillates and the use of liquefied petroleum gases, will take a growing share of gas production. The low capital cost and high thermal efficiency of the plant, the wide availability and attractive prices of the raw materials ensure that new installations will be built for some years to come. They will enable the price of gas to be kept at levels fully competitive for many purposes with other fuels, thus producing steady growth: possibly sales will double within ten years.

The probability of natural gas supplies being increased by the purchase of more liquid natural gas to be brought by ship, by the laying of a pipeline from Holland, or by the finding of gas in the North Sea, is difficult to assess. Manufactured gas, however modern the plant it is made in, is likely to cost a good deal more than natural gas found in Great Britain or nearby, and low transport costs may well make supplies from further afield increasingly competitive. A natural gas field, such as that at Hassi-R-Mel in the Sahara, costs little to operate once it has been discovered, and the cost of natural gas need not necessarily be linked to the price of any particular oil product. If world oil prices harden, and if the costs of liquefying gas and transporting it by sea can be reduced—and they almost certainly can—more seaborne liquid natural gas will be a very attractive source of energy for Britain. It is not yet known how, if at all, Dutch gas will reach this country, but if it does so in large enough quantities, and if substantial reserves of gas are found off-shore, then sales of gas in Britain will multiply, and conversion of town gas supply systems to use natural gas will be put in hand. Total energy use in Britain will increase quickly and the share taken by gas may rise dramatically, the rate of growth far exceeding even that of the early days of gas.

Finally, far far ahead, one can imagine that a change in world availability of hydrocarbon oils and gases may make more attractive the extraction of coal by the future development of automated mining methods such as are now being introduced by the National Coal Board. At the same time nuclear energy may be proving a powerful competitor to coal for electricity generation. The hydrogenation of coal, using hydrogen produced with the aid of nuclear heat, may then be the basis of gas production which will bring as big a change in the shape of gasworks as the steam reformer is bringing today. In anticipation of this the Gas Council is conducting important lines of research into the hydrogenation and gasification of coal.

Whatever the changes to come, the simple, silent flame, causing no more pollution of the atmosphere than the breath of living creatures, and fed by gas produced at gasworks or from gas fields will burn in industrial furnaces and domestic installations wherever a heat service is required. Pipes, out of sight, but capable of conveying so economically great flows of energy will ensure that, no matter whether the gas is made in Great Britain or brought from below the sea bed, the flexible, controllable flame will burn, its task not, as in 1812, to give light, but to provide heat.

SMOKE CONTROL AREAS

Progress Report

POSITION TO APRIL 1, 1964—TOTALS

	England and Wales	Scotland
Smokeless Zones (Local Acts) in Operation ..	44	1
Acres, 3,400		
Premises, 41,060		
Smoke Control Areas in Operation	1,281	39
Acres	285,365	11,639
Premises	1,509,048	92,627
Smoke Control Orders		
Confirmed	244	11
Submitted	109	6
Grand Totals	1,678	57

The lists below are supplementary to the information in the last issue of "*Smokeless Air*" (*Spring*, 1964), *which gave the position up to January* 1, 1964. *They now show the changes and additions to April* 1, 1964.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase. An asterisk denotes that there have been objections and that a formal inquiry has been or will be held.

ENGLAND AND WALES

New Orders Confirmed but not yet in Operation

Acton B. No. 8, Airborough U.D. Nos. 14 to 16, Ashton-under-Lyne B. Nos. 2 and 5, Baildon U.D. No. 1, Barking B. No. 7, Barnes B. No. 5, Barnet U.D. No. 5, Basildon U.D. No. 2, Beeston & Stapleford U.D. Nos. 4 and 5, Bingley U.D. No. 11, *Brierley Hill U.D. No. 15, Darlaston U.D. No. 1, Deptford M.B. Nos. 5 and 6, Ealing B. Nos. 16 and 17, East Barnet U.D. No. 5, Friern Barnet U.D. Nos. 5 and 6, Gloucester C.B. No. 1, Grantham B. No. 8, Hackney M.B. No. 8, Halesowen B. No. 23, Harlow U.D. No. 4, Hayes & Harlington U.D. No. 23, *Heanor U.D. No. 1, Hendon B. No. 10, Heston & Isleworth B. No. 8, Huddersfield C.B. No. 8, Islington M.B. Nos 13 and 14, Jarrow B. No. 2, Knottingly U.D. Nos. 5 and 6, Lambeth M.B. Nos. 9 to 11, Leeds C.B. Nos. 40 and 41, Leicester C.B. Nos. 10 and 12, Mitcham B. No. 2, Old Fletton U.D. Nos. 4 and 5, Peterborough B. No. 1, Potters Bar U.D. No. 1, Preston C.B. No. 8, Sheffield C.B. No. 11, Shipley U.D. Nos. 3 to 5, *Solihull B. No. 4, Southwark M.B. No. 3, Stoke-on-Trent C.B. No. 14, Sutton & Cheam B. Nos. 1 and 2, West Bromwich C.B. Nos. 12 and 13, Westminster M.B. Nos. 14 and 15, Willesden B. No. 6, Wortley R.D. Nos. 5 and 6.

New Orders Submitted for Confirmation but not yet Confirmed

Atherton U.D. No. 2, Barking B. No. 8, Bedford B. No. 3, Birmingham C.B. Nos. 102 to 106, Bootle C.B. No. 6, Brentford and Chiswick B. No. 5, Bromley B. No. 6, Bury C.B. No. 4, Carshalton U.D. No. 5, Castleford B. No. 1, Chingford B. No. 4, Greenwich M.B. No. 6, Hammersmith M.B. No. 6, Harrow B. No. 8, Hemel Hempstead B. No. 4, Ilford B. No. 6, Keighley B. No. 5, Mansfield B. No. 4, Newcastle-under-Lyme B. No. 4, Preston C.B. No. 9, Rochdale C.B. No. 6, Sheffield C.B. No. 14, Skipton U.D. No. 2, Southall B. No. 6, Staines U.D. No. 5, Stepney M.B. No. 5, Sutton Coldfield B. No. 3, Todmorden B. No. 3, Warwick B. Nos. 2 and 3, Westminster M.B. No. 16, Whickham U.D. Nos. 1 to 3, *Wimbledon B. No. 4, Wolverhampton C.B. Nos. 7 and 8, Yiewsley & West Drayton U.D. Nos. 6 and 7.

SCOTLAND

New Smoke Control Orders in Operation

Grangemouth (Beancross), Paisley (Glenburn).

New Smoke Control Orders Confirmed but not yet in Operation

Clydebank No. 4 (Faifley), Coatbridge (Kirkshaws), Stirling County (Stenhousemuir No. 2).

New Smoke Control Orders Submitted for Confirmation but not yet Confirmed

Midlothian County (Livingston New Town No. 1).

Smoke Control Casualties

Below are listed smoke control order schemes that have been deferred, withdrawn, or suspended because of the new arrangements for the conversion of appliances and doubts about the availability of open-fire fuel.

Orders withdrawn before coming operative: Tynemouth C.B., Nos. 1 to 7; Colne B., No. 3; Irlam U.D., No. 3; Queensbury and Sheld U.D., No. 3; Worsley U.D., No. 3.

Orders Deferred: Nuneaton B.; Crawley U.D., No. 5; Watford N., No. 4; Padiham U.D., No. 7 (*six months deferred*); Letchworth B. (*future orders to be reviewed in one year*); Darwen B. (*all future orders*); Whickham U.D. No. 1.

Applications to the Ministry for suspension of orders in operation: Chesterfield B., Nos. 1 to 4; Darwen B., No. 1; Newton-le-Willows, Nos. 1 and 2; Mansfield B., No. 3; Harrow B., No. 6; Shrewsbury B. (*to submit a revocation order*).

Dear Sir . . .

We Wish to be Smokeless

This was the headline of a story in the *Yorkshire Evening Post* of April 29. The account went on thus:

"Occupiers of premises all over Leeds are writing letters to the Health Department calling for a speed-up of the programme for making smoke control areas in the city. They ask: 'Cannot our area be dealt with next?'

"This was stated by Mr. J. Goodfellow, Leeds Chief Public Health Inspector, in a speech he made to the Health Congress at Torquay today.

"He told delegates: 'We have now made 41 smoke control orders in Leeds, and my experience has been that people living where these orders are operative have greatly appreciated the improvement of conditions, despite the expense with which they were involved."

This was referred to in a leader in the same issue of the paper. It said:

"The average amount of smoke in the central area has gone down by over 50 per cent in 11 years. Now people are writing to the Leeds Health Department asking for a speed-up of the programme for making smoke control areas. We can think of no other project which deserves such priority. Re-housing a slum dweller in a new flat is not the whole answer if the risks of chest disease remain the same."

Double Offence

For the emission of dark smoke within the meaning of the Clean Air Act, 1956, a firm in Macclesfield was recently fined £5. One of the owners of the firm was also fined £2 for having assaulted a Public Health Inspector. The two cases were tried separately, and in the second the defendant pleaded guilty to a technical offence.

Underfloor Draught Fires

The British Coking Industry Association (74 Grosvenor Street, London, W.1) have published an Information Sheet (No. 7) on underfloor draught fires. Though particularly concerned with the use of Sunbrite in this type of fire, the technical information given is of course of general application and will be valuable to Public Health Officers in respect of smoke control area installations.

Manchester's Diesel Smoke Checks with Meter

Manchester City police are reported to be making a six-month trial of spot checks on lorries emitting exhaust smoke, making use of a portable smoke meter.

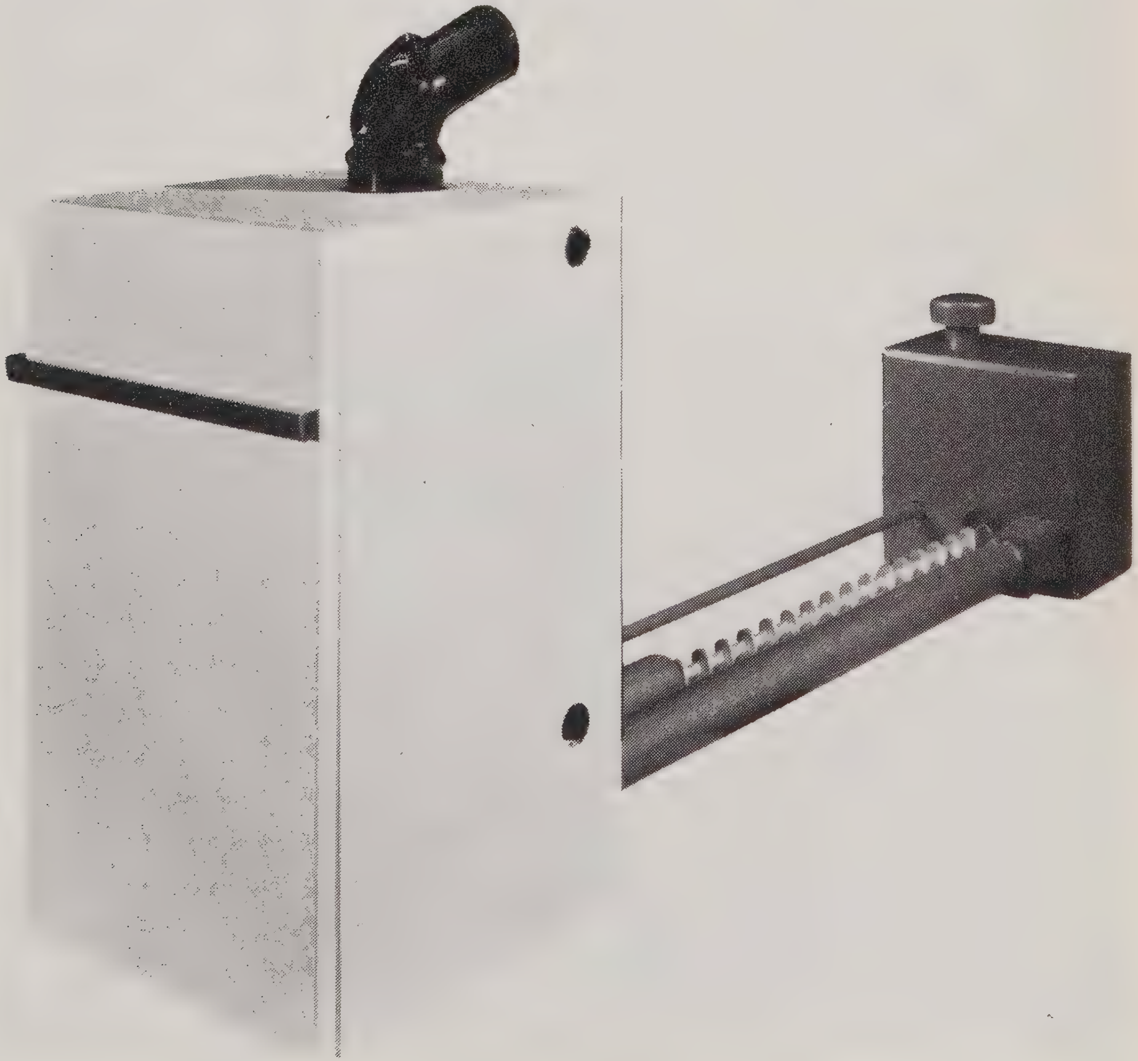
AUTOMATIC BOILER TO BURN COAL SMOKELESSLY

The Stokermatic

What is claimed to be the first completely automatic domestic central heating boiler, which will burn coal smokelessly, is the Stokermatic B.65, which will be on the market in August. Developed by Draysley Ltd., of West Drayton, the boiler draws its fuel from an external fuel bunker (of any size desired), by means of a screw feed that is operated by a ¼ h.p. electric motor.

The boiler has been designed to conform with standard kitchen units, and is 21 in. square and 36 in. high. It is attractively styled to match modern kitchen décor. The external case temperature is so low that it can be used as an additional working surface in the kitchen.

The B.65 burns singles—a carefully graded natural fuel of high calorific value which has been washed and cleaned. It is conventional in its application in that it will provide a



The Stokermatic with the boiler unit in the foreground, showing the screw feed that carries the fuel from the external bunker, with the driving motor at the back prime source of heat for any existing small bore system and it needs only a five inch flue connection. It is noteworthy that this fuel while when burnt in a normal domestic appliance produces a prohibitive amount of smoke, burnt in the B.65 produces no smoke and complies with the provisions of the Clean Air Act. The B.65 has been approved by the Domestic Solid Fuel Appliance Advisory Council. at a rating of 65,000 Btu's an hour. At this output its water heating efficiency is 71 per cent and its fuel consumption is less than 7½ lb. an hour, while if a lower output is required it will operate quite satisfactorily at say 25,000 Btu's an hour with a negligible reduction in efficiency.

The cost of fuel varies in differing parts of the country from £6 to £8 a ton delivered and it is particularly suitable for bulk storage enabling the consumer to take full advantage of reduced prices for quantity and seasonal delivery.

Another advantage is its automatic operation. No fuel has to be carried into the house. The only domestic chore is the daily removal of a clinker.

The enclosed diagram shows a B.65 feeding a typical hot water installation in a three bedroomed house. The unit consumes approximately 62 units of electricity per ton of fuel and the annual running costs for a three bedroomed house are less than £35. The retail price of the B.65 is £185, and a network of qualified distributors is available to ensure correct installation of the unit and its subsequent maintenance.

CLEAN AIR POLICY

The NSCA Appeal to Local Authorities

As reported in our last issue (page 201) the Executive Council of the Society has submitted to all local authorities in the "black areas" a statement on the new smoke control area situation, with an appeal to the authorities to press on with their programmes. The statement was also issued to the Press and was given much helpful publicity.

Replies have been received from many authorities, and are continuing to come in as we go to press. Additional copies of the statement were offered for distribution to members of Councils or Committees, and some 600 have been asked for.

The replies themselves have varied considerably in their content. Some have been a mere formal acknowledgement, others have advised us that the statement has been received by the Council and in a few cases a really constructive comment is enclosed and useful information given.

One local authority in South Wales draws the attention of the Society to a proposed district heating scheme and points out that such schemes can be an important factor in reducing the dangers and inconvenience of smoke emission. A neighbouring authority points out that only low volatile coal is used in the area and this does not give rise to black smoke!

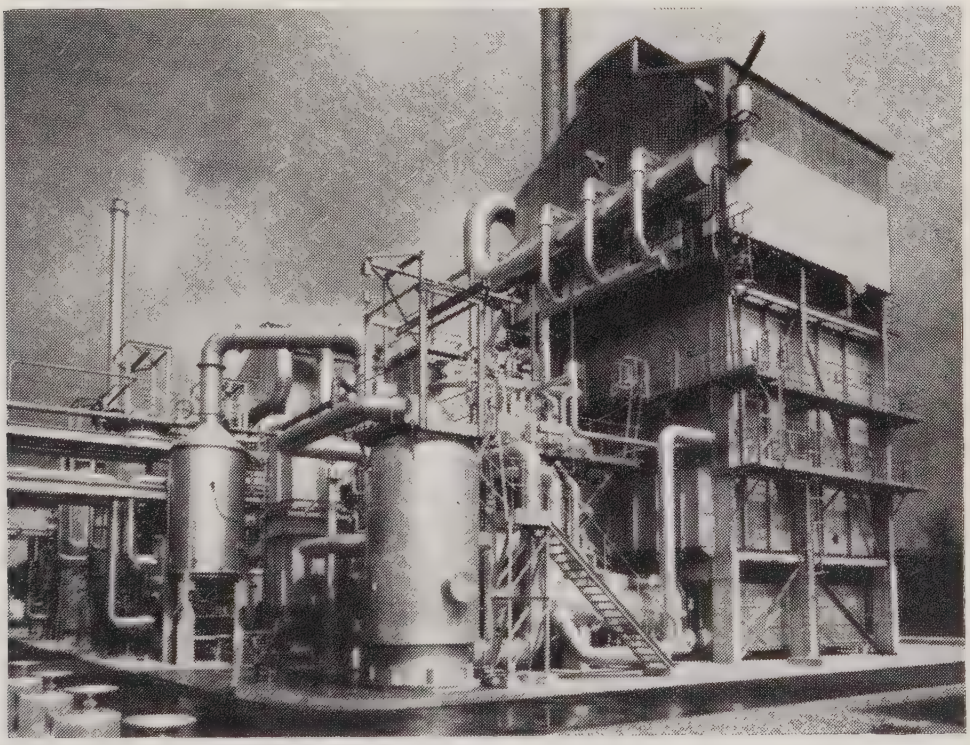
In Birmingham the statement prompted the Health Committee to pass a resolution confirming the intention of the City to proceed with the establishment of further smoke control areas in accordance with the programme originally approved by the City Council. Many refer to set-backs and express the hope that they will be of a temporary nature only. A local authority in Yorkshire expresses concern at the heavy cost that has to be borne by old people affected by clean air orders and inquires whether special consideration is being given to this aspect of clean air and asks for action to relieve old people with limited incomes of this burden.

A London Borough reported that it was steadily pursuing the establishment of smoke control areas and anticipated that the entire Borough would be a controlled area within the next year or so, but went on to say they were very much concerned about pollution from the exhausts of motor vehicles and requested information on the latest developments in this connection, aimed at a reduction in road vehicle emissions. Another was concerned about excessive emission from diesel exhausts and railway locomotives and an even more fundamental issue was raised in a letter from Yorkshire regarding the problem of concessionary coal to the 75-80 per cent of householders in the district connected with the mining industry.

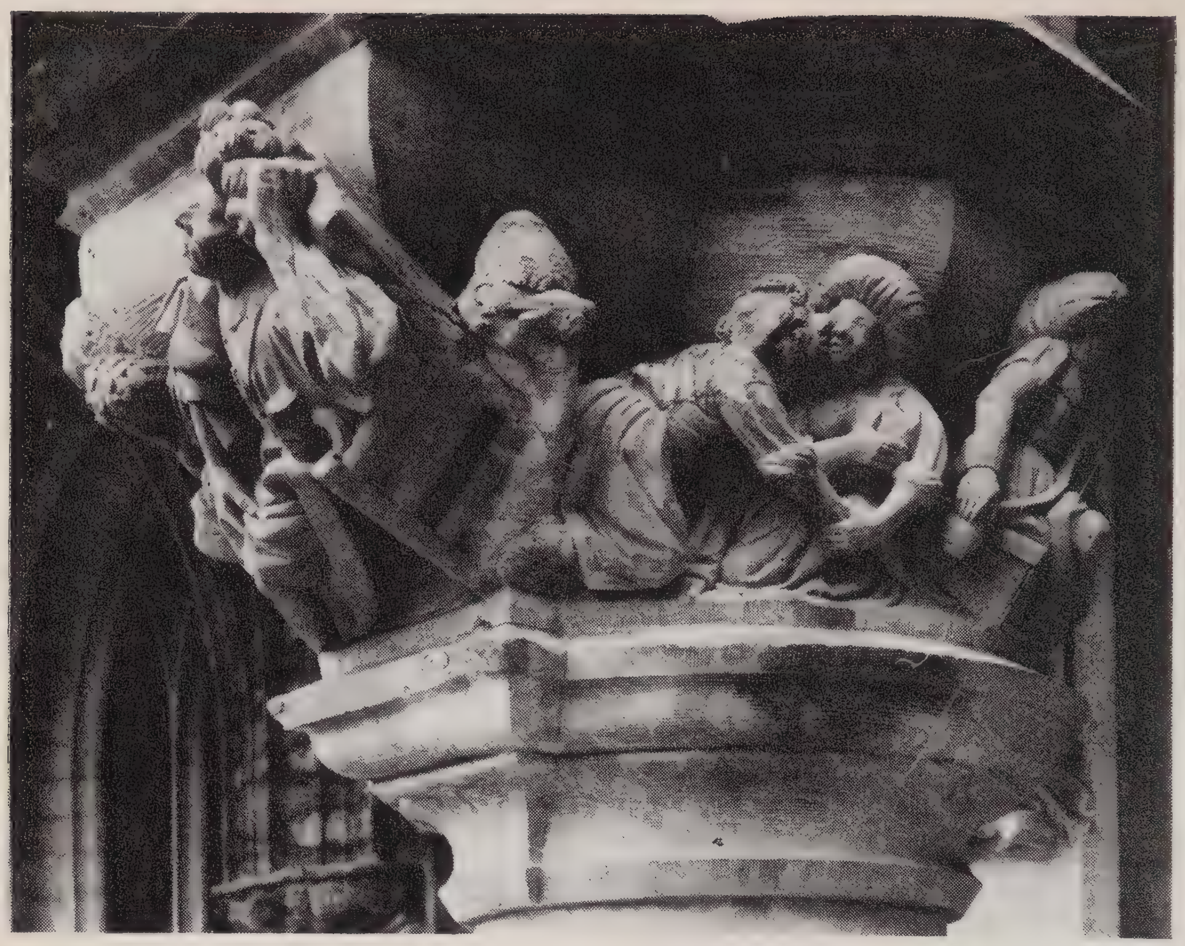
A County Borough in the North East reported that owing to the fact that no more supplies of smokeless solid open fire fuels were to be made available in the Northern region and the additional cost involved in carrying out alternative adaptation, the Council had decided not to seek confirmation of the seven smoke control orders already placed with the Ministry and to make no further smoke control orders for a period of two years when the matter would be reviewed again in the light of the prevailing fuel situation.

Eleven provincial newspapers have featured the statement and one Tyneside newspaper reports that a local authority Health Committee was annoyed by what they considered a "cheeky letter" from the National Society for Clean Air. In Derbyshire a local paper reported that the implementation of the Clean Air Act was causing drastic hardship for old folk, some of whom were going without food to buy smokeless fuel. The *Builders Merchants Journal* for April headlines the Society's offer to help local authorities.

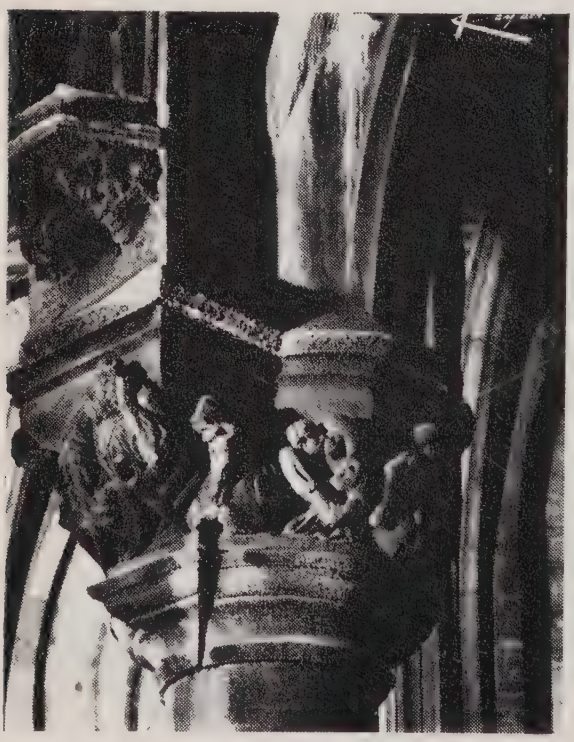
It is hoped to receive further replies from local authorities and to produce a detailed report for the Parliamentary and Local Government Committee.



The New Style Gas Works—The New Southern Gas Board's continuous catalytic reforming units at Hythe, which will add 35 million c. ft. of town gas per day to the area gas grid. The picture shows the No. 2 Reforming Furnace on the right with the Waste Heat Recovery System (centre) and the carbon monoxide reduction plant



Brussels



Brussels

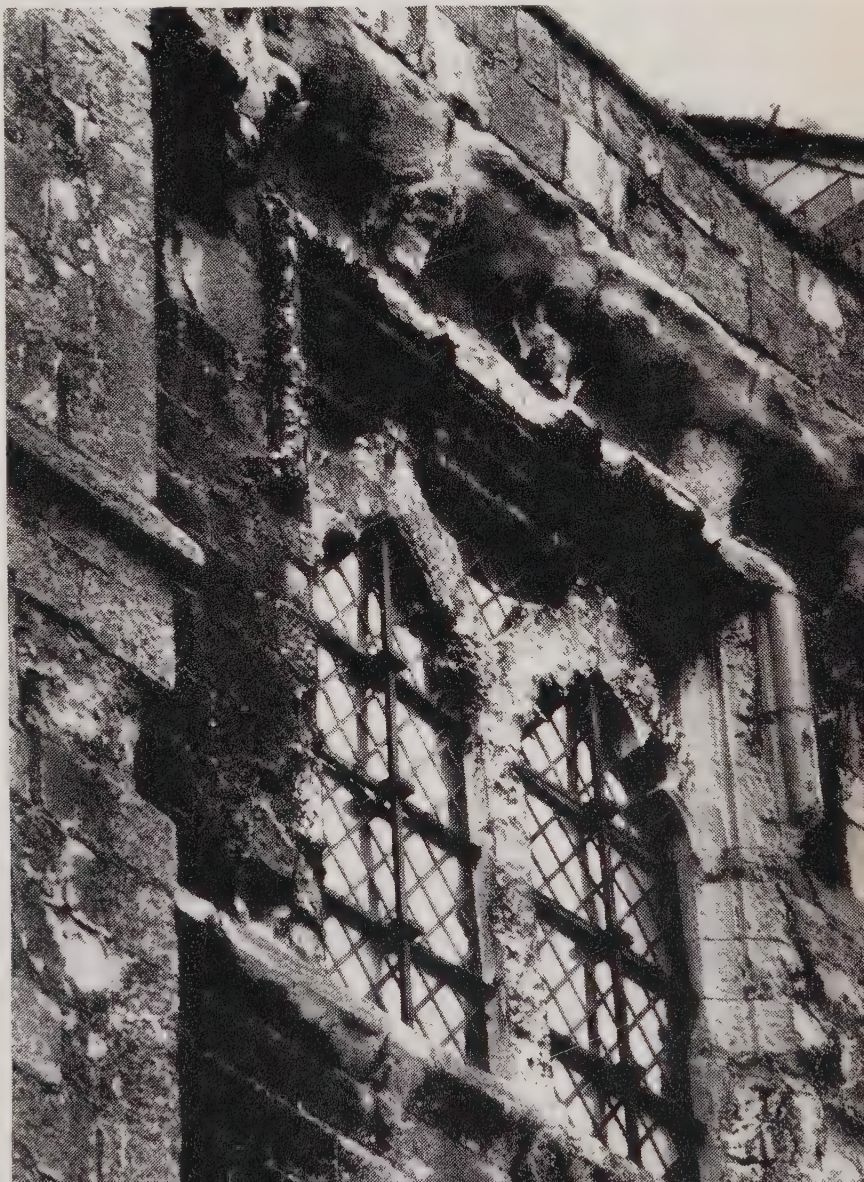
Bristol

CRUMBLING STONES

Here are some new and striking examples of blackening and erosion of stonework due, in part at least, to air pollution. On the right is the Hotel de Ville, Brussels, before it was cleaned. Our frontispiece photograph on page 278 shows the building as it now looks. Opposite, bottom left, is a group of carved figures on the building, and above, the same group after the cleaning.

Opposite, bottom right, is what was once an imposing and elaborate carved cross on the west front of Bristol Cathedral, for the restoration of which an appeal for £300,000 has been launched. (The Cathedral is now in a smokeless zone). Another striking photograph from Bristol is the stone elephant we have used for the cover of the Clean Air Year Book.

Below is another English Cathedral —Chichester—for which a restoration appeal (£289,000) is being made. The appeal says: "The effect of weather and air pollution over the years has led to widespread erosion of the stonework, which is breaking away and falling. The walls are being gradually pulled outwards and unless this movement is arrested it cannot be long before the stone roof collapses."



Chichester

SCIENTIST ADDRESSES INSPECTORS

Dr. L. E. Reed, at Clacton-on-Sea

Each year the joint consultative committee of the London, northern home counties and south-eastern centres of the Association of Public Health Inspectors arrange refresher courses for their members which take the form of a week-end school. At the sixth annual school which was held recently at the Oulton Hall Hotel, Clacton-on-Sea, one of the subjects chosen for discussion was clean air and Dr. L. E. Reed, A.M.I.MECH.E., Principal Scientific Officer of the Air Pollution Division of the Department of Scientific and Industrial Research at the Warren Spring Laboratory, Stevenage, gave the address.

The speaker was introduced by Mr. H. G. Cripps, chairman of the Association's south-eastern centre council and began his lecture by screening a series of graphs to illustrate trends in fuel consumption. He stated that there had been a marked decline in industrial coal consumption with the exception of the amounts used in electricity generating stations, and alongside this, oil consumption had increased. There had been a consequent reduction in industrial smoke emissions but domestic fuel consumption had remained fairly constant. Although there had been a noticeable reduction in smoke over London there had been no reduction in the level of sulphur dioxide and readings taken over a five-year period indicated that London had 37 per cent less hours of sunshine than elsewhere.

The type of air-pollution which affected a city like Los Angeles where exhausts from vehicles produced an irritant smog which accumulated in low-lying areas of the city between the hills was different from the kind of pollution to be found in London. Both petrol and diesel driven motor vehicles created their own problems, the diesel engine creating black smoke when misused, and in America a device was being developed to reduce pollution from exhausts by means of a pelletted platinum catalyst. In this country fifty observers from Dr. Reed's department were engaged in observing amounts of smoke produced at the roadside and the Ministry of Transport were making spot checks and finding that 10 per cent of vehicles emitted black smoke and while some smoke was inevitable, it had to be reduced to a minimum. Most smoke was produced when vehicles were pulling up hill and as stationary tests were desirable engines were put into neutral and rapidly accelerated when being tested.

Turning once more to the elimination of sulphur dioxide pollution, Dr. Reed discussed the washing of flue-gases and said that dry processes were

School at Clacton
Left to right: G. A. Hiller (Leicester CPHI), Chairman of the General Council; J. A. Cummins (PHI, Finchley); Dr. L. E. Reed (Warren Spring); and H. G. Cripps (CPHI, Beddington and Wallington)

now favoured such as the German Reinluft process in which activated carbon removed heat from flue-gases, concentrated the sulphur dioxide and eliminated it. He made reference to chimney heights and the Ministry of Housing and Local Government's memorandum and screened a short length of film made by his department to illustrate the effect of smoke dispersal of chimneys of varying heights and criticized town-planning departments which insisted on low chimneys and chimneys with covered tops.

Discussion

The discussion was opened by Mr. J. A. Fish of Hemel Hempstead who queried whether London's smoke had been greatly reduced and wondered why diesel engines should smoke and if the cleaning of fuels would help to eliminate sulphur dioxide. Dr. Reed replied that engines could be de-rated to reduce smoke and in the normat way some smoke was unavoidable bul continuous smoking was unnecessary, and said that the National Coal Board were investigating the cleaning of fuels but higher costs would result from this.

Mr. H. Mousdell of Horsham was curious to know the type of fuel used at Warren Spring Laboratory and by Dr. Reed personally, and the latter vouchsafed that at Stevenage oil was used, whilst in his own home he used a closed stove burning solid fuel. Replying to a comment that many diesel vehicles were over-loaded and that there was little regular examination of commercial vehicles, the speaker agreed and stated that the standard of commercial vehicle maintenance was not as good as it should be. Public service vehicles were of course inspected every six months, and he felt sure that the Ministry of Transport would like to carry out more inspections of commercial vehicles but insufficient examiners were available. Mr. D. Edge of Benfleet discussed the cost of fuels, central heating and improvement grants and wondered if we should plan for the future by requiring chimney heights particularly in rural areas to be higher than at present allowed.

A representative from Southwark, Mr. J. W. Starr, mentioned the connection between air pollution and lung cancer and wondered which other pollutants were prevalent and Mr. M. J. Desmond of Basildon queried Dr. Reed's statement that gas sales had dropped over the last ten years when in his town sales had increased by 40 per cent. Dr. Reed agreed that sales had increased and explained that it was the percentage of this type of fuel in comparison with other fuels sold which had decreased; he listed other pollutants as carbon monoxide, oxides of nitrogen and fluorine but would not comment upon the incidence of lung disease.

In reply to Mr. G. A. Faulkner of Crawley who had enquired about smoke velocities, Dr. Reed stated that increased velocities could be obtained by constricting chimney tops or by increasing heights by two diameters, and, answering a question propounded by Mr. D. J. C. Hamer of Chailey regarding the tolerance level of smoke pollution, said that although the overall pollution from vehicles was not high, the concentration of smoke and sulphur dioxide in main roads was heavy and invisible pollutants were dangerous.

Mr. G. A. Hiller, Chief Inspector of Leicester, stated that where various companies had objected to the capital cost involved in the construction of tall chimneys the onus should be placed upon the Minister to decide this point on appeal, and the discussion was brought to a conclusion with Mr. R. A. Beglay of Walthamstow and the speaker enlarging upon the measures taken to cure a particular smoke problem at a factory at Higham Hill.

The chairman then brought the proceedings to a close by proposing on behalf of the assembled company a hearty vote of thanks to Dr. Reed which was unanimously endorsed by the one hundred and sixty public health inspectors present.—*J. Howard-Watson.*

‘Off-peak’ electric storage heating is officially recommended for future Smoke Control Areas

(See Ministry of Housing and Local Government Circular No. 69/63)

Electric storage heaters meet all the requirements of the Clean Air Act.

Cheap to install. For existing premises, Unit-plan storage heaters are ideal—all that is needed for installation is a simple wiring job. For buildings still at drawing-board stage, electric floor warming is the cheapest system of all—it is incorporated as an integral part of the structure.

Cheap to run. Electricity is available at ‘off-peak’ rates. The cost per unit may be as little as *one-half* the normal rate.

Clean and convenient. ‘Off-peak’ electricity provides today’s cleanest and most convenient form of heating. It complies *in every respect* with the requirements of the Clean Air Act.

Electric storage heating supports the Government’s intention of encouraging vigorous action against pollution of the air in our cities and towns. It can make important contributions to this policy.

Free leaflet entitled “When your neighbourhood becomes a Smoke Control Area . . . here’s how Electricity can help you”—written to advise and inform the public. Fill in and post this coupon now for one copy—bulk supplies obtainable through your Electricity Board.

To: Electrical Development
Association (P/MT)
2 Savoy Hill, London W.C.2.

EDA

Please send me a free *copy of “When your neighbourhood becomes a Smoke Control Area . . . here’s how Electricity can help you”.*

NAME ....

ADDRESS ....

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THE POTTERIES—PROGRESSION TO A CLEANER ATMOSPHERE

By

G. E. Earnshaw, M.R.S.H., F.A.P.H.I.

Senior Smoke Inspector, City of Stoke-on-Trent

A Paper read to the West Midlands Division of the Society at Stoke-on-Trent on April 22, 1964

I INTEND, today, to depart from the general pattern that may have been followed by speakers at your previous annual meetings, by dealing mainly of the past and not of current and future problems of abatement of atmospheric pollution, and illustrating my talk with photographs, as the majority of you present have not, and never will be able to see the types of furnaces that were used in the pottery industry and which were the major cause of the pollution in the past.

Many of you when visiting towns and villages, and this is not confined to places that are considered picturesque, will find in the main street, view cards on sale. Some of you will buy these and send them to friends with the usual greetings. You can do this in Stoke-on-Trent, but you can also—and Stoke is almost unique in this respect—buy view cards showing the amount of smoke produced by its industry with captions such as "Fresh air from the Potteries"; "Change of air soots me well at Stoke-on-Trent"; "Shadows of the evening steal across the sky", etc. Recipients may think they are scenes of today, whereas they are of 54 years ago. There have been objections made to their sale but visitors say they send them home as a joke; to local residents, particularly the younger generation, and to visitors, the cards show by comparison with today the enormous improvement that has been effected in the atmosphere of this district.

Most of the pottery manufactured in this country takes place in Stoke-on-Trent, and for at least 200 years it has been the staple industry of the district. Unlike many manufactured products, each stage in the preparation of raw materials, and in the manufacture of the article, needs heat treatment. The only fuel that was available and was capable of producing this heat was coal. The next largest industry in this district was coal mining, and whether or not the pottery industry settled here because coal with a high volatile content was available, it did provide ample and cheap supplies of coal.

In order to produce and impart the heat to the raw materials, and to the ware being fired, furnace designs have been developed in the course of centuries for each particular stage of the process. It is these furnaces known as bottle-ovens and kilns that gave the district, apart from smoke, its outstanding characteristic. A person born and reared in this district may not have been aware of this fact, but a visitor can often see it in a different light. J. B. Priestley, in his English Journey, said of this district in 1933: "There was more smoke than I had ever seen before, so, that if you looked upon any of these towns the drift over it was so thick that you searched for the outbreak of fire. There were no tall chimneys, no factory buildings frowning from above the streets, but only a fantastic collection of narrow-necked jars or bottles peeping up above the house tops on every side".

These pottery factories—pot banks as they are called—were confined to the old and congested parts of the six towns. They were mainly family concerns, many of them small, in many cases built cheek by jowl with

One of the postcards still on sale at Stoke-on-Trent

the cottages of the operatives.

The outlets or chimneys of the hovels surrounding the ovens and kilns were no more than 25 to 60 feet high so the smoke, particularly during adverse weather conditions, filled the house yards and streets like a fog. What the housewives thought of this on washing day, I don't know.

Some 40 or more years ago, it was probably true to say that the Potteries had no rival in Britain, or possibly the world, as far as its smoke was concerned.

This could be expected when one considers that at that time, grouped mostly in the confines of the six towns, there were at least 1,286 ovens, 829 kilns, 437 boiler chimneys and more than 1,987 chimneys serving other processes and heating appliances in connection with the 350 pottery factories. In addition there were 14 brickworks, 12 tileries and 15 collieries each with chimneys in connection with boilers and ovens on the respective works.

Fortunately, not all the ovens and kilns were being fired at one time; some would be cooling after being fired, some being emptied (drawn), some being filled (placed), while some may be out of use, depending on the state of the trade at the time.

These ovens and kilns were started up from cold at each firing and the period of firing and temperature to be attained depended on the class of goods being produced and the stage of production of the goods.

Stage	*Period*	*Temperature attained*
Bisque	48-82 hours	1,100°-1,200°C
Glost	24-40 hours	1,050°-1,100°C
Decorating or Enamel	16-20 hours	700°- 800°C

In the bisque and glost firing the ware was placed in the ovens in saggars, each saggar depending on the size of ware being fired, and the flames and gases of combustion surrounded the saggars. The decorating and enamel kilns were of the muffle type, the muffle being heated directly by the flames and the ware inside the muffle indirectly by radiation from the muffle walls.

The firing of an oven was almost a profession in itself as there was so much at stake in the oven. Long experience was necessary as a few minutes carelessness could often mean

The same view as the postcard—as it is today

ruin to the oven's contents. The firing of an oven is entirely different to firing a boiler, where the aim is to ensure complete combustion on and over the firegrate. This can be appreciated when it is considered that an oven can vary in size from about 15 feet to 20 feet in diameter inside and 15 feet to 30 feet high inside and is almost filled with saggars. The final temperature to be attained must be as even as possible throughout. The long flames produced by the high volatile coal are employed to carry the heat to the middle of the oven. Temperature rise must be controlled, as a satisfactory finished article depends on the time it is subjected to heat at varying degrees of temperature. When it is realized, in the case of the bigger ovens, that a ton of coal could be fed to an oven within the space of minutes, it can be appreciated how difficult it is to attain smokeless combustion.

Fifty Years Ago

It is very interesting to learn what was being thought and what was being done about smoke abatement over 50 years ago. In the local daily paper of 1908 there is a lengthy report of the proceedings of the quarterly meeting of the Midland Centre of the Sanitary Inspectors Association, which was held in Longton (one of the six towns). At that time, it is reported, some manufacturers were using producer gas to fire their ovens, another had spent £10,000-£15,000 on building gas ovens and the result was a failure. Another said he was reluctant to risk £10,000 at his time of life in experimenting with other systems. In a paper read by the Sanitary Inspector, it was said that the need for smoke abatement was realized, as a conference of local authorities and the Manufacturers' Association had taken place some years before when a speaker had said that "until experiments had been made with a real and earnest desire to get at the solution of the problem the matter would remain as it was then". It had been proposed to set up a fund for prosecuting experiments but no headway had been made. It could not be expected that small manufacturers had the time or capital to devote to experiments, while large manufacturers who had the capital would not, but were ready to adopt an appliance when others proved it workable. The interested individual was left to follow his inclinations. There had been attempts to arouse the Local Government Board to action in the matter.

Apparently, town's gas was far too expensive to be used for firing purposes, and any approach to clean air would be by the use of producer gas. The local authority were reluctant to take proceedings regarding the smoke emissions which were caused by the operations of the staple industry.

The six towns were federated into one county borough in 1910 and since 1914 has employed a full time smoke inspector.

It was the practice to use the better lump coal on the ovens and kilns, and the small coal drifted to the boilers. This would make it more difficult to prevent smoke emissions from boiler chimneys. The numerous colliery boilers were hand-fired using the unsaleable coal, and these received some protection under the Public Health Act.

Limits of black smoke emissions were fixed by the local authority both for boilers and ovens, although they had not the force of law, and records show that there were many prosecutions regarding smoke emissions from boiler chimneys. For ovens and kilns the limit was 10 minutes black smoke per baiting. It was realized that it was impossible to avoid such emissions at certain stages of firing, but the excesses, due to carelessness and lack of maintenance of ovens, were dealt with by the Inspector.

It is difficult to believe that the efforts of the Smoke Inspector did not have some effect in persuading firms, possibly the individual as mentioned, to carry out experiments in the firing of their ware by smokeless means. Also, although the source of coal was on the doorstep, and it must have been obtained very cheap, it was realized that a large amount of fuel was wasted with the then methods of firing and that firing by smokeless fuels would result in savings.

The First Gas-Fired Kiln

As far as is known, the first continuous gas-fired tunnel oven was installed in 1911 to the design of the inventor—Conrad Dressler. This was fired by producer gas and was 160 feet long, six feet high and 12 feet wide. For a number of years it would appear that the use of tunnel ovens was confined to the firing of wall tiles in the glost or glazing stage, the bisque firing of the tiles still being carried out in intermittent coal-fired kilns.

Progress in introducing smokeless methods of firing was very slow; much experiment was necessary as manufacturers had to be careful that the quality of their ware was not affected and, as a result, their name. However the first kiln to be fired by electricity was brought into use in 1927 and, for a number of years, its use was confined to firing ware at the decorating stage. The first town's gas-fired continuous kiln was installed in 1932.

The editorial of the *Evening Sentinel* of August 4, 1932, sums up the situation at that time, as follows: "The bulk of the firing is in intermittent ovens which involve considerable periodic smoke emissions—obviously wasteful of heat. At present the intermittent oven holds sway for bisque firing even in the tile trade, where continuous firing is so largely adopted—only one factory is using a tunnel kiln for bisque ware. For glost and enamel firing, the continuous kiln is fairly extensively used. Progress is being made surely if not rapidly. The younger generation should see the Potteries as smokeless during normal industrial operations as during Stoke Wakes Week".

Besides the firing difficulties to be overcome, conversions, particularly where it involves the glost and bisque stages, require major factory re-organization to cater for continuous flow of ware and unless both space and finance is available, conversion is necessarily liable to be deferred and, in some cases, can only be achieved by erection of a completely new factory. Another problem to be overcome in regard to tunnel ovens is mining subsidence.

Shortly after the last war, the rate of changeover to firing by smokeless fuels accelerated, so much so that the fuels were not available. Some firms anxious to proceed put in gas producers to work their kilns. As further plant was installed by the Gas and Electricity Boards and increased supplies of gas and electricity became available, conversions continued and the producer gas plants were dispensed with.

Up to some 10 years ago, conversions consisted almost entirely of continuous kilns, as it was considered it made the best use of the more expensive fuels. About that time the intermittent kiln received greater consideration and both the truck and top-hat type, using gas and electricity were developed. The difficulties of space and finance were largely overcome and, as they could be arranged in batteries, it allowed of flexibility in use according to trade conditions. If it had not been for this development it is quite possible that the change-over to smokeless methods over the last ten years, particularly in the china section of the industry, would not have been as quick as it has been.

After 1945, smoke abatement was again applied with vigour by this authority. Most of the boiler plant was old, and many of the attachments previously provided to ensure better combustion, had worn out or fallen into disuse. Although there was a period when similar devices were again being sold and fitted, firms were encouraged to fit mechanical stokers, or, where necessary, provide new plant. Excessive smoke emissions from ovens and kilns again received attention, and where they were due to bad firing or maintenance, efforts were taken to correct same—a successful prosecution was taken against one firm.

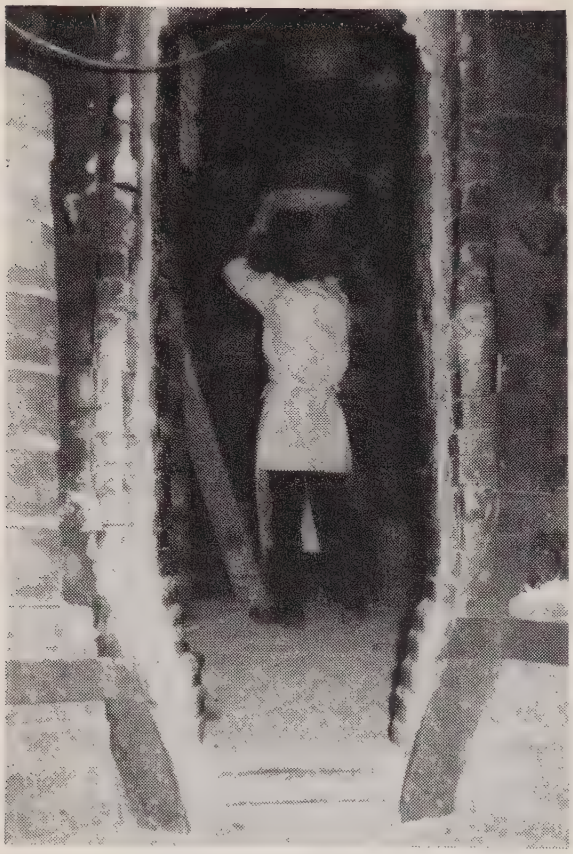
Following the operation of the Clean Air Act, hand-fired boiler plant has almost been eliminated.

Usually, once most or all of the pottery firing processes had been changed to smokeless methods, the old methods of clay and ware drying were modernized which eliminated further sources of smoke from drying beds and stove pots.

The following table shows, progressively, the approximate number of smokeless ovens and kilns installed, and the industrial gas and electricity consumption.

The coal-fired intermittent pottery oven and kiln will soon be a thing of the past, today there cannot be more than 30 left in operation. There have been efforts made to have ovens and

		1933	1939	1949	1954	1962
Electricity	*Intermittent* . .				163	548
	Continuous	12	28	78	111	107
Producer Gas	*Continuous*	30	24	10	9	—
	Intermittent . .					106
Town's Gas	*Continuous*	5	75	165	258	296
Fuel Oil	*Continuous*	—	—	3	5	18
TOTAL		47	127	256	546	1,075
Gas Consumption (*million cubic feet*)		23	1,341	3,108	5,179	7,108
Electricity Consumption (*million units*)		5	10	37	60	110



Loading a bottle kiln

kilns retained in their operative conditions as museum pieces—a link with the past, but only one firm has thought fit to do this—Messrs. W. T. Copeland & Sons Limited. This is a small oven that was used for firing china bisque ware.

The Heavy Clay Industry

Turning to the local heavy clay industry which manufactures roofing tiles, floor quarries, bricks—including blue, and refractories, there does not appear to have been any serious efforts made towards smoke abatement until 1936. Some of these works were sited away from town centres and, as housing development took place around them in the 1930's, complaints of nuisance arose. A considerable number of observations were taken and prosecutions were instigated by the City Council against three firms and abatement orders obtained in each case. I believe that this Council was the first to do this in a case where blue goods were being produced. The result was that ovens were repaired, draught improved, secondary and tertiary air flues provided and, as a result, smoke emissions reduced.

When this industry got into its stride again after the war, the smoke abatement procedure was enforced and the industry continued its efforts towards reducing smoke emissions.

Firms producing red goods and refractories experimented with the use of under-feed stokers on their round down-draught kilns and found them a success. Eventually they changed most of their ovens to this type of firing and smoke emissions were reduced enormously. Some ovens were changed to oil-firing.

One firm producing blue edged roofing tiles re-built some of their ovens and provided secondary and tertiary air preheating flues. Two firms carried out experiments with mechanical stokers on ovens to produce blue floor quarries and blue roof ridges, but were not completely successful. A further firm producing red floor quarries, changed over to gas-fired tunnel ovens. This was the position, generally, when this industry came under the Alkali Regulations. The two firms referred to have re-designed the particular ovens and now produce their blue goods by a mixture of stoker and hand firing with a reduction in smoke emissions.

Steel and Iron Works

I have not mentioned the fact that there was one large steel works and at least one iron works in the district. As you are aware, most of the processes carried on were protected under the Public Health Act, 1936.

The steel works, during the first half of the 1950's, were troubled with a large number of "slips" in the operation of the blast furnaces due to the use of English ores which contained a large amount of fines. House property in reasonably close proximity to the works, was covered with dust—the roofs attained a reddish appearance. This matter was taken up with the firm and they spent £1¼ million on coke blending and sintering plants which cured the trouble. One can appreciate the improvement by the fact that a deposit gauge which has been sited in a nearby park since 1955 produced an average reading of 54 tons per square mile per month during the first year, and the average monthly reading for subsequent years have been 47, 45, 37, 37, 25, 27, and 22 respectively.

The firm have now almost completed an £18½ million modernisation programme which will produce steel by the Kaldo process instead of by means of open-hearth furnaces.

One result that was experienced by the introduction of tunnel kilns for firing pottery was the emission of fluorine. This gas was obviously emitted from the intermittent kiln but, as it was not a continuous emission and not always discharged from the same point, any effect it had was not noticed. The effect of the emission from the tunnel ovens was noticed on nearby house windows which became etched and eventually opaque. This trouble arose during the bisque stage of firing, and it was agreed between the City Council and the industry that the gases either be heated in a washer or be discharged through a tall chimney. One firm installed a washer and others erected tall chimneys, the height being agreed with the Health Department.

A few years ago, some suppliers of Cornish stone for the pottery industry arranged to de-fluorinate the stone before delivery, and there is a Manx stone available that is fluorine free, with the result, where firms have changed to either type of stone, a tall chimney has not been demanded. The firm which installed the washer made the change-over last year and discontinued the use of the washer. A firm manufacturing enamel frits caused similar trouble in the vicinity of their works, and after pressure was brought to bear, erected a 120 feet high stack through which the gases were discharged.

The remaining phase of smoke abatement in the City, that is the

Loading a modern gas-fired continuous kiln introduction of Smoke Control Areas, although not up to schedule, is well under way.

The layout of the City, being six towns strung out from north-west to south-east, does not provide a centre, as is found in many cities, therefore, in 1959 the formulation of the Five-Year Programme for establishing Smoke Control Areas was not straightforward. At that time there were many more pottery ovens in operation than there are today and it would not have been policy to have these within a Smoke Control Area. The policy then was to commence on the outskirts of the City to the south-west and work inwards and deal with the town centres as and when the use of the pottery ovens ceased.

To date, some 2,090 acres are covered by confirmed Orders affecting approximately 3,869 houses and other premises. This includes the centres of Hanley and Stoke-on-Trent.

A Footnote

Councillor Eric Gibbon, who was to have presided at this meeting, had prepared the following note on Mr. Earnshaw's paper. He wrote:

I am very pleased this Paper has been given as I felt a burning sense of injustice as regards conditions in Stoke-on-Trent ever since the Manchester Professor cast aspersions about the smoke conditions in the City at the Blackpool Conference in 1951, referring in particular to a distinguished works we are visiting this afternoon, who had by that time done most of its reconstruction.

Possibly a few notes and additional figures about the new kilns described in Mr. Earnshaw's paper would be of interest.

From the manufacturers angle there are three big savings:

Loss: The method of firing and handling the product in saggars in the old coal-fired intermittents (bottle ovens), caused loss from breakage and more particularly from dirt. The ease of placing in modern kilns and the clean conditions have reduced the loss figures enormously.

Labour: Carrying the heavy saggars into and out of the kilns, and up the ladders (horses), was very heavy work, which has now been made easy as the photographs shown today illustrate.

Fuel: This is self explanatory, in view of the very low efficiency of the old kilns in which the whole carcass had to be heated up and cooled down each firing. Some figures on the fuel savings are given below.

The coal required to burn in the old fashioned intermittent kilns the amount of ware that is being fired in the new units, would be about 727,000 tons per year. Against this the amount of coal used in the gasworks and power station to produce the refined fuels used on the new kilns is 473,000 t.p.a., a direct saving of over a quarter of a million tons, as against an annual consumption of about 22,500 tons of oil.

The savings do not end here, as firstly there is the smokeless coke and other by-products available from the gasworks, and secondly a conversion figure for the lower quality of coal used at the power station. These indirect figures save in coal equivalent another 230,000 tons so that in direct and indirect savings, and after deducting the coal equivalent of the oil used, there is a saving of about 450,000 tons coal equivalent per annum.

From our clean air aspect the most interesting figure is the reduction in the smoke that would have been sent out from the old intermittent kilns, and if one takes the Beaver report figure of $1\frac{1}{4}$ per cent this is equivalent to about 9,000 tons of smoke per year, mathematicians can convert this into smoke particles.

Just as a matter of interest the capital investment in these kilns, if at present day costs, would represent about £15 millions.

Our next issue will contain reports of the Council of Europe Conference at Strasbourg and of the U.S.A. Conference at Houston, Texas.

A Trio of Annual Reports for 1963

WARREN SPRING

The annual report of the Warren Spring Laboratory for 1963 (H.M.S.O., 4s. net), includes air pollution as one of the four divisions of activity reviewed. The others are chemical engineering, mineral processing and what is termed "human sciences".

The Chairman of the D.S.I.R. Steering Committee for the Laboratory, Sir Harry Melville, pays tribute to Mr. S. H. Clarke, who retired as Director at the end of 1963, having been in that office since the establishment of the new Laboratory since its formation in 1957. He has been succeeded by the former Deputy Director, Dr. C. C. Hall.

The section on air pollution in the report reviews trends in air pollution, the London fog of December, 1962, the dispersal of chimney gases, the work on the removal of sulphur dioxide from flue gases by the Reinluft process, and, of particular interest, a comparison of pollution in areas under smoke control with similar non-control areas.

For an 18 month period a table shows the average concentration in about 15 pairs of comparable sites. This shows that on the average the smoke control areas have 71 per cent of the smoke and 96 per cent of the sulphur dioxide of the non-control areas. For six summer months the figures are 59 and 90 per cent respectively, and for twelve winter months 73 and 97 per cent respectively. The report comments: "This difference must be considered very encouraging in view of the fact that few of the smoke control areas were large, so that they would probably be affected by pollution from neighbouring districts when weather conditions were such as to prevent normal upward dispersion."

THE BRITISH IRON AND STEEL FEDERATION

The Federation's report for 1963 is again a publication that is rich in colour illustration and liberally interspersed with graphs and visual tables.

The chapter on raw materials will be of special interest to members of the Society. Purchases of coking coal by the Industry fell by 700,000 tons and blast furnace coke by 200,000 tons. Reference is made to the continuing decline in coal consumption for purposes other than coking and to continuing improvement in fuel efficiency, 1963 witnessing a significant fall in the thermal input of all fuels required to produce a ton of iron.

Fuel oil continues to grow in importance as a steelmaking fuel, total consumption now being 3,240,000 tons of heavy hydrocarbon oil as against 15,200,000 tons of coking coal. Some steel companies wish to use light distillate feedstock oil as a booster fuel but the duty of 2s. 9d. a gallon makes this uneconomic.

The average ratio of scrap consumption to steel output increased to 51·8 per cent from 51·1 per cent in 1962 and the pattern of scrap demand is explained.

Clean air is rightly classified as an item related to increased efficiency and the industry claims to have continued to co-operate in the use of the best practicable means to minimize the emissions to which some of its processes give rise but the problem of containing waste gases given off from bottom-blown converters remains intractable. Problems associated with arc furnaces have been discussed with the Alkali Inspectorate and an earlier decision that cleaning plant should be required on all open hearth furnaces using oxygen for refining is being progressively implemented. The first report of the Working Group on Air Pollution from Arc Furnaces was circulated to all steelmakers, to the Alkali Inspectorate and to equipment makers.

There is a gratifying reference to the industry being fully conscious of its social responsibilities with regard to air pollution and the kind words of Dr. Carter at the meeting of the Iron and Steel Institute in November regarding "the best practicable means" to minimize air pollution are quoted.

The role of vacuum treatment techniques in meeting the growing demand for improved steels for special applications is illustrated. Delegates to the Society's forthcoming Conference at Harrogate will have an opportunity to see a 100-ton vacuum degassing unit operating at the new Tinsley Park Works of the English Steel Corporation in the course of a works visit arranged for delegates. The Tinsley Park Works is described in the report as the most significant development scheme of the year.

Other illustrations show the gas cleaning plant on the open hearth furnaces at Guest, Keen Iron and Steel Works at East Moors and the electrolytic tinning lines producing differential coating on tinplate at the Steel Company of Wales' Plants to meet the challenge of the highly competitive packaging market.

A useful appendix lists the membership of the Air and River Pollution Committee and a list of current development schemes emphasizes the importance of proper fuel use, gas cleansing and dust collection.

B.C.U.R.A.

The 1963 Annual Report of the British Coal Utilisation Research Association records the appointment of Sir Humphrey Browne, C.B.E., Deputy Chairman of the National Coal Board, as the President of the Association to succeed Dr. W. Idris Jones, C.B.E., and the appointment of Dr. L. H. A. Pilkington, J.P., as the Chairman of Council.

The terms of grant-aid from the Department of Scientific and Industrial Research for the five-year period 1964-1968 are that provided the Association raises an annual grant-earning income of £300,000, the Department will make the Association an annual grant of 30 per cent of the grant-earning income up to a maximum total grant of £180,000 for the year. In 1963 the total income from all sources was nearly £535,000 thanks to substantial increases in the subscriptions from the National Coal Board and the Coal Distributors; many other Members have also agreed to increase their subscriptions and the National Coal Board will further increase their subscription to a total of £370,000 in 1968. The Association should now be able not only to meet the rising costs of doing research but also to expand its work.

The main task of the Association is to improve and cheapen the ways of burning coal, or alternatively to find an economic method of first gasifying the coal completely. The present programme and those planned for the immediate years ahead include combustion studies of a laboratory, pilot plant, and large-scale character relevant to the use of coal in large power station boilers, in industrial boilers and furnaces, and in domestic appliances; also the study of certain gasification processes.

The fundamental studies of the combustion of coal have been further developed and, in addition, a new laboratory programme on the behaviour of coal and coal minerals at very high temperatures has been started. The study of the physical properties has been concerned chiefly with the various ways in which the energy necessary to pulverise coal is used or dissipated.

The applied researches have so far been mainly concerned with the problems of using coal in conventional and well-developed boilers, furnaces and domestic appliances, in an attempt to widen the range of solid fuels that can be used efficiently and to overcome some of the ancillary problems of availability and automaticity.

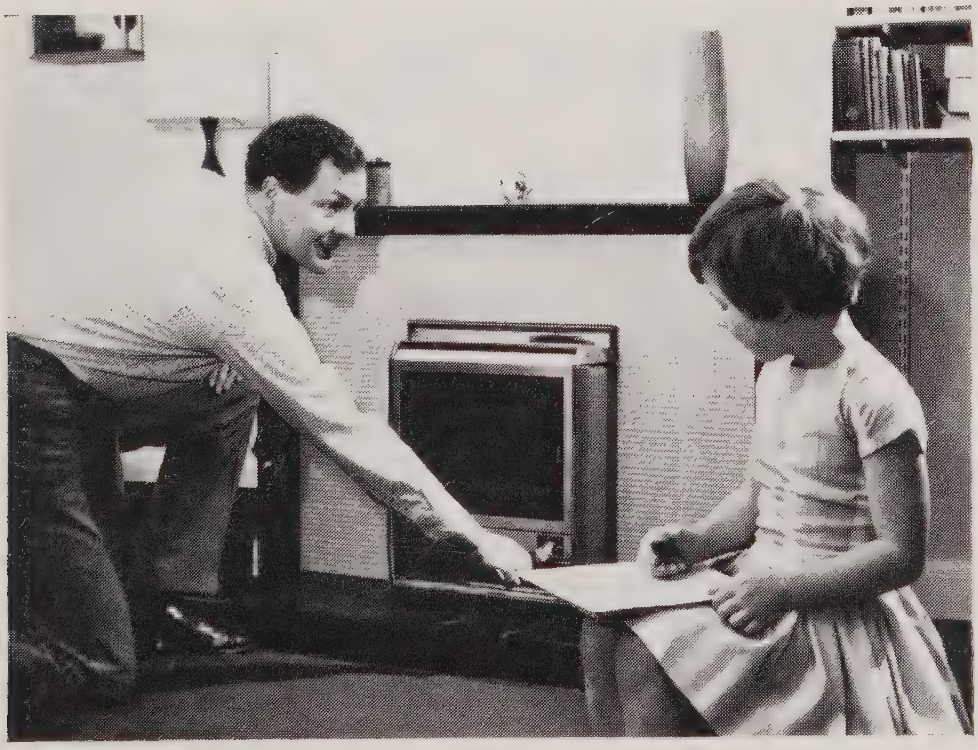
The automatic control of the shell boiler has been further improved as also has the handling of coal by means of screw feeders. A systematic study of the clinkering behaviour of a wide range of coals showed that when properly operated there was little or no clinker formed and that slag build-up on the ignition arch was prevented by water cooling. Preliminary tests on recycling of flue gases showed a substantial reduction in the formation of deposits. New developments concerned the design and testing of a vibrating grate and the initiation of a study of the dynamic response of a boiler under varying load.

Extensive tests have been completed on ten central heating boilers as a step to improving their efficiency and amenity. The cheap central heating heat meter has been further improved and field tests will shortly be undertaken. Some further advances have been made in the development of a coal-fired household central heating boiler for burning bituminous coal smokelessly, but much still remains to be done to achieve a successful commercial design.

The Report, price one guinea, may be obtained from the Director of Intelligence and Publications, B.C.U.R.A., Randalls Road, Leatherhead, Surrey.

TWO NEW N.C.B. FILMS

The N.C.B. Film Unit have filmed the story of quantity production of "Homefire" at Birch Coppice. Besides providing heartening evidence of the Coal Board's commitment to clean air, the film, entitled *Homefire*, emphasizes the attractions of the new fuel which will burn in any open grate and give a good flame. If exposed to the elements it absorbs less moisture than any other solid smokeless fuel or coal and is shaped to avoid the hazard of rolling off the grate when burning or being stoked. The intention to undertake large scale production of solid smokeless fuel is emphasized towards the end of the film. Suitable for general audiences. Showing time, 12 minutes, filmed in colour.



Still from "Homefire"

The second film, *Housewarming*, is the story of a real family's search for their ideal central heating system. A young couple and their three small children are the "stars" of the film and they are seen viewing the wide range of excellently designed solid smokeless fuel appliances now on the market.

Eventually a boiler serving eight panel radiators, a towel rail and supplying hot water is chosen together with a room heater in the living room. The film rightly emphasizes the importance of correct installation and a check up by a heating engineer after trial running. The procedure for arranging a loan, repayable over a period of five years, is explained and the vital new fuel bunker illustrated.

Although a "promotional" film *Housewarming* will be very useful for showing when householders are confronting the need to change over from primitive heating arrangements. It lasts for 17 minutes and is in colour.

Both these films are available on free loan from the National Coal Board Film Library. Please note the new address: 26-28 Dorset Square, London, N.W.1 (adjacent to Marylebone Station).

Another Diesel Smoke Check

Of 25,600 diesel-engined vehicles observed on the road by Ministry of Transport technical staff in a check at 91 places throughout the country on April 8, about 3,000 were emitting too much smoke.

On the 3,000, some 2,000—or about eight per cent of the total observed—were prohibited from carrying goods. In 107 cases the prohibition took effect immediately: in other cases a few days' grace was given in which to remedy the defects.

Comparing these results with those obtained at a similar check in September 1963, the ratio of "smokers" to "non-smokers" increased from one in ten to one in eight, and the proportion of diesel-engined vehicles observed which were subjected to prohibition notices increased from six per cent to eight per cent.

The Ministry says it will continue these roadside checks, both nationally and regionally, to discourage the emission of unnecessary smoke. Action will be taken against owners and drivers of offending vehicles.

Catalytic Combustion

Through its British office we have received from Kavag Katalytische Verbrennungsges M.B.H., of West Germany, a paper on "Industrial Odour Removal through Catalytic Combustion". This describes how the low temperature oxidation of combustible gases and vapours takes place in the presence of a catalyst—in principle the same as flame combustion, but taking place at a much lower temperature and consuming fume even down to trace amounts. The catalyst material used by Kavag consists of specially activated platinum-group metals, which are deposited on thin nickel-alloy ribbon crimped and packed to provide the maximum available catalyst surface. The ribbon is uniformly distributed in mat form, protected by alloy screens and surrounded by alloy channel frames.

Some of the processes in which the catalyst can be used are paint baking, sewage treatment, wire enamelling, paint and varnish manufacturing, drying ovens of many types, metal coating and lithographing, paper printing, and a variety of chemical processing operations.

Information can be obtained from the British office at Somerset House, George's Square, Halifax.

When you go back into the Smoke . . .

A friendly review, with quotations, of the new NSCA bookmark in the *Halifax Daily Courier and Guardian* concluded with a little anecdote that contains much truth:

We recall the conversation of a friend who strolled the other day from Skircoat Green and Salterhebble, Halifax (since last July a smoke-control area), to Siddal (where the chimneys still wear plumes of smoke). "It was a chilly day, and I expect people were stoking up fairly well," he said, adding: "I would never have thought the smell of smoke could be so strong. It must have been the same in our neighbourhood till last year, and I never noticed it. But I certainly notice it now!"

A Setback—but Beneficial

Cleaner Air through Smoke Control Changes

The Director of the National Society for Clean Air, Arnold Marsh, O.B.E., was one of the speakers at a recent conference at Llandudno of the Federation of Co-operative Fuel Merchants Associations, which was opened by the Chairman of the National Coal Board, Lord Robens.

In the course of his address, on the clean air programme and solid fuel, Mr. Marsh emphasized that on the industrial side the Clean Air Act was making good, quiet progress, and that dark smoke had been reduced to about half of what it was ten years ago. He continued:

"On the domestic side—now the most serious factor in the air pollution problem—good though perhaps slow progress has been made through the setting up of smokeless zones or smoke control areas. The latest figures show 1,365 such areas in operation, containing over a million and a half homes and other premises.

"The drive against home smoke has recently had something of a knock because a new basic plan has had to be adopted in place of the original one, in which the main burden of the changes to be made had rested on open-fire gas coke. Now, this fuel, though it will not disappear for many years, is beginning to diminish as the gas industry turns to new and more economical ways of producing its main fuel.

"This means that in the main the change from the old-fashioned open coal fire must be made with gas itself, with solid smokeless fuels suitable for room-heaters, electricity through off-peak uses, and oil. Technically, there is nothing to stop smoke control going ahead faster than before, and the one serious snag is that the appliances required cost more to buy, even though some of them can provide heat more cheaply than with any type of open fire.

"The setback is likely to be only temporary, for the simple reason that the drive for clean air calls for the same improvements in domestic heating that the public is demanding anyhow. Not before time, there is a big revolution in progress in our standards and requirements for domestic heating, and all the new methods are of course smokeless. Fortunately, too, all the fuel and power suppliers have achieved developments that make this possible—gas with its new room-heaters and central heating systems, electricity with new off-peak heating methods, oil with central heating and new types of flued heaters, and solid fuel with its new design roomheaters, underfloor draught fires, central heating including, at long last, automatic boilers that can burn coal smokelessly. There is also a welcome revival of interest in the possibilities of district or group heating.

"In the long run, too, the setback we have encountered will prove to be beneficial. Not only do the new methods give heat without smoke, but they either eliminate altogether the emission of sulphur dioxide, or they reduce it to a level far below that of the open fire, simply because the fuel is being used so much more efficiently, so that less is required. Thus a closed roomheater burning solid smokeless fuel at 60 per cent or more efficiency, emits only a third of the sulphur given off from an old-style fire using coal at little more than 20 per cent efficiency.

"The clean air movement may have been hustled into a new situation, and there may well be some slowdown for the moment, but the end result will be air cleaner and healthier than we could have hoped for under the former plan."

Later in his address, Mr. Marsh appealed to fuel merchants to give the clean air drive their full support. "Because we have had to condemn the open coal fire", he said, "we have sometimes been regarded as 'against' coal. This is far from the truth. We need coal, as well as the other fuels, to help us to achieve clean air, and all we ask is that it shall be used without smoke. If one looks at the trends in domestic fuel usage, extending the graph line to 1970 or 1980, the prospects for solid fuel in the home look pretty bleak—unless, that is, the industry and the merchants play their full part in promoting the scrapping of the old and the adoption of the modern, clean, efficient appliances. The clean air movement, far from being the enemy of coal, should be looked upon as an ally and benefactor."

Dry Hole in the Clean Air Act?

The *Manchester Daily Express* (February 26) reported an interesting problem of interpretation from Jarrow-on-Tyne. For the purposes of the Clean Air Act a ship to be a ship must be afloat. What is the position, it was asked, when a ship is in dry dock, and the dry dock is in a smoke control area?

BRINGING IT HOME TO US!

Tar-spraying outside the offices of the Society recently.

New Technical Books

Heating and Ventilating—Principles and Practice, by J. J. Barton, M.I.H.V.E., M.Inst.F., A.I.E.E. George Newnes, pp. 504, 50s.

This new work combines both the theoretical principles of heating and the practical factors in installation. It will be an invaluable reference book for all engaged in the industry. There are chapters on the heat requirements of buildings, methods of heating, boilers, boiler houses and boiler installation, pipework, valves, radiators, ventilation and air conditioning and fuel consumption and running costs.

The author, in dealing with underfeed, automatic, bituminous coal stokers and the requirements of the Clean Air Act, stresses the need to introduce secondary air over the fire to ensure complete combustion at all times.

Other subjects dealt with include gas heating, oil-firing, hot-water and steam heating systems, electrical heating systems and unit heaters and warm air heating.

In two appendices are given the British Standards and Codes of Practice, relating to heating and ventilating and a set of conversion tables.

"Gas Journal" Directory, 1964, Walter King Ltd., 30s.

This annual comprises a directory of the gas industry with details of the Area Boards, national and kindred organizations, and list of members of the Institution of Gas Engineers; a handbook of technical data and a directory of advertisers' products.

Handbook of Heating, Ventilating and Air Conditioning, by John Porges, M.I.Mech.E., M.Inst.F., 5th edition. George Newnes Ltd., Illustrated, 40s.

In this edition of the heating and ventilating engineers' day-to-day reference book, the author has revised and amplified much of the text and, in view of the increased interest now

Continued on page 329

NEWNES BOOKS

HANDBOOK OF HEATING, VENTILATING AND AIR CONDITIONING

by John Porges, M.I.Mech.E., M.Inst.F. (Revised by F. Porges, LL.B., B.Sc.Eng.)

Covers the complete field together with some aspects of fuel technology and building construction. The presentation is largely in tabular form for easy reference. A concise manual for practising heating and ventilating engineers, students, architects, quantity surveyors, builders, and fuel technologists. **320 pages, tables and diagrams, 5th Edition. 40s (41s. 6d. by post).**

HEATING AND VENTILATING

Principles and Practice

edited by J. J. Barton, M.I.H.V.E., M.Inst.F., A.I.E.E.

The book presents in a clear and practical manner, essential information relating to the design, installation, and maintenance of all types of space heating, and ventilating systems. **500 pages, 83 half-tone photographs, 242 diagrams, tables. 50s. (51s. 6d. by post).**

To be published June—

GAS PURIFICATION PROCESSES

editor : G. Nonhebel, M.A., D.Sc., F.R.I.C., F.Inst.F., M.I. Chem.E.

Covers purification of crude gases; gas absorption including centrifugal gas absorbers and regenerative processes; solid chemical absorbents; purification of cryogenic gases; adsorption; catalytic destruction or conversion of impurities; removal of grit, dust, sprays and mists; and air purification. **912 pages, 347 line illustrations, 20 half-tone plates, tables, index. 140s. (post free).**

FROM ALL BOOKSELLERS
or, in case of difficulty at post prices shown from George Newnes Ltd., Tower House, Southampton St., London, W.C.2.

NEWNES

Electricity in Scotland

North of Scotland Hydro-Electric Board. Annual Report and Accounts 1963. HMSO, 5s. 6d. net.
South of Scotland Electricity Board. Annual Report and Accounts 1963. HMSO, 6s. 6d. net.

THE demand for electricity in Scotland continues to increase at a rate so rapid that it has necessitated a review of plant extension programmes.

The output in the North of Scotland amounted to 2,309 million units, an increase of 251 million or 12·2 per cent. The output of the South of Scotland Board was 10,282 million units against 9,355 million in 1962, an increase of 10·1 per cent.

The two Boards offer an interesting contrast, the Northern Board having a comparatively thinly populated area and relying mainly on hydro-generation while the Southern Board has a more closely settled area and relies mainly on thermal generation.

The Mackenzie Committee last year recommended that the functions of the two Boards should be transferred to a single authority. However, this proved unwelcome to a wide range of interests and the Secretary of State decided to maintain the separate existence of the two Boards, and to see that the closest consultation and co-operation took place between them.

In the Northern area the run-off from the catchment areas during the first two months of the year was the lowest on record and during the year was 80·3 per cent only of the long-term average, the amount by which the run-off was less than average representing about 568 million units. During deficient periods thermal generation was at a maximum and imports of 456 million units were taken from the Southern Board.

The Northern Board's installed capacity amounted to 1,046,708 kW hydro-electric, 132,875 kW steam and 42,286 kW diesel in the outer islands. There was no extension during the year to steam plant but extensions to Carolina Port, Dundee, were made to accommodate two 120 MW generators and boilers. The installation of a 275 kW diesel set at Tobermory and a 2,890 kW diesel set at Lerwick was in progress and consent had been obtained for a 2,890 kW set at both Stornoway and Kirkwall. The Board has in operation 54 hydro-electric stations and has under construction the 400,000 kW Cruachan pumped storage plant. A pumped storage plant of 1,200,000 kW based on Sloy is under preliminary investigation.

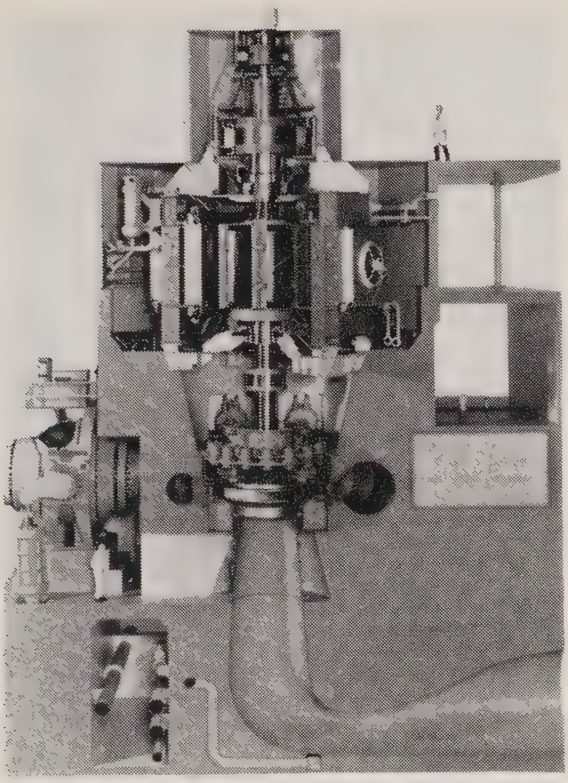
The maximum demand on the mainland system was 686,000 kW, an increase of 68,000 or 11 per cent over 1962. Sales to the South of Scotland Board totalled 385 million units and purchases from that Board amounted to 456 million units.

The distribution system was extended by the opening up of 97 route miles of 275 kV line, making a total of 269 miles and 1,967 circuit miles of 132 kV line in use. During the year 62 overhead line faults occurred, 34 during the blizzards of February. Icing occurred on the Corrieyairack and Lecht Passes. The total number of consumers connected at the end of the year was 413,508, of which 328,602 were domestic and 16,226 were crofts. 86 consumers still remain on D.C. The average price per unit paid by consumers was 1·773d. and the average cost of production and purchase was ·9372d.

Capital expenditure amounted to £16,531,000, making a total at the end of the year of £259,667,000.

After providing for depreciation and interest charges there was a loss of £316,819, reducing the credit balance to £62,707.

The South of Scotland Board has installed 2,232 MW of steam plant in



Model of one of the two 142,000 h.p. turbines at the Cruachan hydro-electric power station. For scale, note the size of the human figures

twelve stations, 107 MW in the Galloway hydro-electric scheme and 15 MW in the Lanarkshire hydro-electric scheme, all with an output capacity of 2,195 MW. The highest demand on the system, between 5.30 and 6 p.m. on December 19, amounted to 2,694 MW, an increase of 9·9 per cent on 1962. At the time of maximum demand 95·9 per cent of plant was available, an additional 3·1 per cent was obtained by overload, 333 MW was taken from the North of Scotland Board and 184 MW from the Atomic Energy Authority at Chapelcross. At the same time 5,000 kW was exported to the Central Electricity Generating Board.

In view of the rapid increase in demand the Board has had to remodel its development programme and between 1964 and 1971 envisages the installation of 4,405 MW, including the pumped storage plant of the North of Scotland Board at Cruachan. In addition the Board is to install 195 MW of peak-load gas turbine plant. The programme includes a new station at Cockenzie of 1,200 MW and a 2,400 MW station at Longannet to be erected on land partly reclaimed from the Forth by ash from Kincardine. The Hunterston Nuclear Station of 360 MW should be commissioned this year. The installation cost of steam plant is expected to be as low as £40 per kW compared with £53 per kW in plant commissioned in 1953. The load factor of the steam plant was 46 per cent. Off-peak supplies, for heating, floorwarming and water heating rose by 46·6 per cent. 4,617,596 tons of coal (including 409,484 tons of washery slurry) were consumed at a cost for coal of 106s. 4d. a ton. The overall efficiency of steam generation (excluding Barony) was 28·1 per cent, while Kincardine reached 34·69 and Portobello 31·62 per cent.

The average price per unit sold was 1·594d. and the average cost of revenue expenditure was 1·581d. per unit. The trading revenue amounted to £68·3 million for electricity and £6·2 million from other sources. A profit of £1·6 million resulted from the year's trading.

The distribution system has been extended and the 275 kW ring for the major part has been completed. A route has been selected from Cockenzie for the new interconnection with the English grid. This will ultimately be operated at 400 kV.

11,350 new consumers were connected during the year, bringing the total to 1,399,117. The average consumption by domestic consumers was 3,532 units while that of the 96·6 per cent of all farms in the South of Scotland that are connected amounted to 13,803 units.—*A.J.C.*

New Technical Books—*concluded*

being taken in the metric system, the section on conversion factors has been considerably expanded.

Other new matter includes more detailed data on heat emission of high buildings and a section on high velocity air conditioning.

Oil Heaters for Smoke Control Areas

Latest Types of Appliance

BECAUSE of changes in the availability of smokeless fuels described in the Ministry of Housing and Local Government's Circular No. 69/63 and the Minister of Power's White Paper (Cmnd. 2231), alternatives to solid smokeless fuel are now necessary for the continued implementation of the Clean Air Act.

The use of oil in properly designed smokeless appliances was authorized by Statutory Instrument No. 541 on April 8, 1957. The conditions for eligibility to a clean air grant for paraffin heaters were laid down in paragraph 34 of the Ministry of Housing and Local Government's Circular No. 69/63. Paraffin heaters which comply with the Oil Heaters Regulations, 1962 (S.I. 1962, No. 884), and which are fixed, are eligible, subject to the usual grant conditions.

In these circumstances, it may be of interest to detail some of the oil-fired appliances which may be used for home heating in Smoke Control Areas.

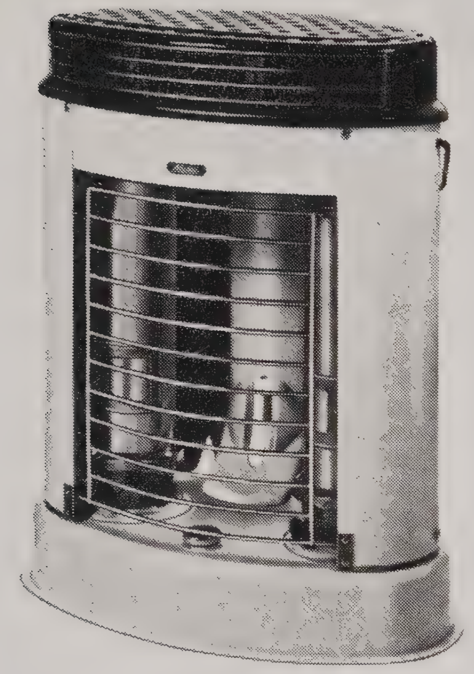
Paraffin Heaters

The cheapest of all appliances to run is the paraffin heater, which is produced in two basic types, the radiant and the convector heater.

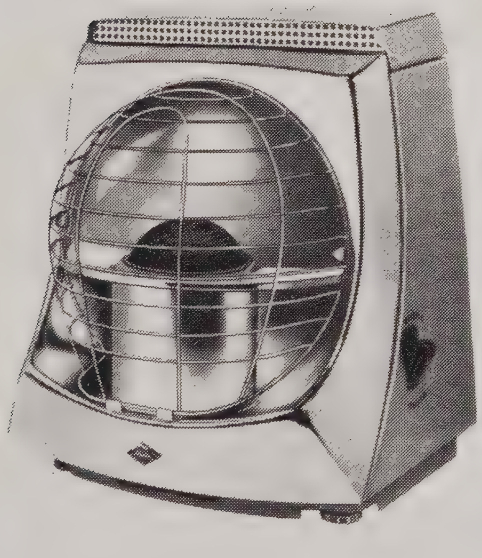
A good example of the radiant heater is the Aladdin Senator, marketed by Aladdin Industries Ltd., of Greenford, Middlesex, which retails at £16 19s. 6d. With an output of 9,000 B.t.u./hr. its running cost is 1¾d. an hour. The radiant heaters in the Rippingille Fyrside range retailing between £11 19s. 6d. and 16 guineas provide a similar performance, as do the Hawkins Safeguard at 14 guineas, the Taywill Sceptre at £14 19s. 6d., and the Harper Beatrice at £12 9s. 6d. The Leo-Fi, with a similar performance and selling at £15 19s. 4d., has the added advantage of fitting easily into a fireplace. It is made by the Lion Stamping Co. Ltd., of Stratford, London.

Of the convector type, the Aladdin range extends from the Aladdinette to

The Swedish Husqvarna flued convector



The Aladdin Duet dual purpose heater and (when cover is removed) cooker



The Aladdin Senator

the Duet Heater with twice the output, selling at £15 9s. 11d., with a duration of 24 hours on one filling at maximum output of over 11,000 B.t.u./hr.

The Rippingille convector runs for 24 hours on eight pints at maximum output of 6,000 B.t.u./hr., and costs £9 15s. 9d. In the Harper Beatrice range the model "800" at £10 14s. 11d. and the Taywil Dudley "50" at £9 2s. 7d., both provide a similar output.

All these heaters have the Oil Appliance Manufacturers Association's Seal of Safety and Reliability, conform to the most recent British Standard, and meet the requirements of the Oil Heater Regulations, 1962.

Flued Convectors

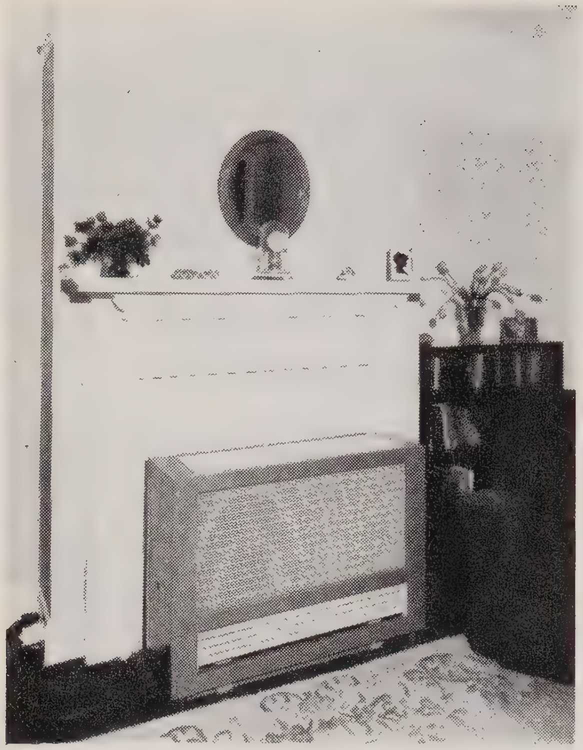
The flued convector is an appliance producing warm air which is discharged into the room by convection. Although full heating is supplied only to the room in which it is installed, the flued convector provides considerable warmth to all other rooms of the house by the flow of warm air.

An example of this type of heater is the Blue Bird, made by Graham Stewart Ltd., of Leatherhead, which has an output ranging from over 40,000 B.t.u./hr. down to 5,000 B.t.u./hr. with a high degree of efficiency throughout that range and consequent consumption economy. Purchase and installation costs for this unit may be as low as £90, and running costs vary between ¾d. and 6d. per hour, depending on the rate of firing.

Another popular convector is the Swedish-designed Husqvarna, marketed by A. H. Bibbey (Sales) of Sawbridgeworth, Herts. This compact unit can produce between 8,000 B.t.u./hr. and 16,000 B.t.u./hr. which is sufficient to heat a living room of about 2,000 cu. ft. to a temperature of 65°F. against an outside temperature of 30°F., or give a high level of background heating throughout the house.

Full Central Heating

Full central heating confers the benefit of all-round heat in every room



The Blue Bird flued convector

The Wilson "Wallflame" boiler burner

under all conditions and can be completely automatic. It is essentially the modern form of heating. The cost can be partly offset by the grant payable under the Clean Air Act, for which it qualifies and by loan schemes which bring it within the pocket of almost any householder.

Small-bore water heater radiator systems are those most usually employed today for full central heating.

The boilers for these systems may use vaporizing burners, including a variant called wallflame, or pressure jet burners.

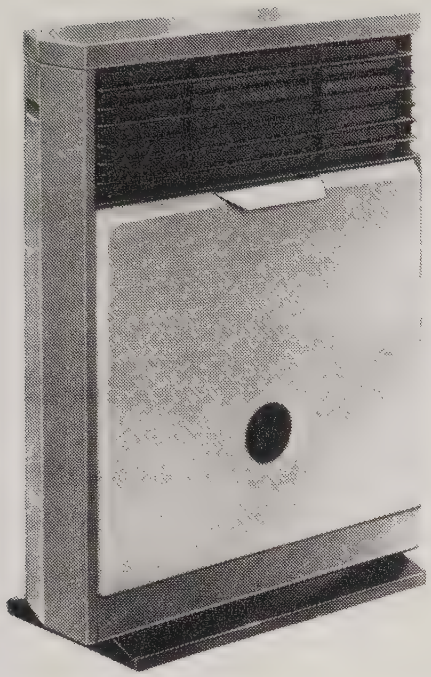
Examples of units using the wallflame burner are the range made by Henry Wilson & Co. Ltd., of Liverpool, from 45,000 B.t.u./hr. to 150,000 B.t.u./hr., and costing between £101 and £207; and that marketed by Thos. Potterton Ltd., from 47,000 B.t.u./hr. to 100,000 B.t.u./hr. and costing between £110 and £170. B.S.A. Harford Ltd. also produce similar units ranging from 45,000 B.t.u./hr. to 150,000 B.t.u./hr., costing from £100 to £185. All these boilers are attractive in design, small in size and can be installed in most kitchens.

The Perkins Mini range of boilers use either vaporizing or pressure jet burners. All the Perkins Mini boilers can be installed in the structure of the house and provide outputs of between 50,000 B.t.u./hr. and 150,000 B.t.u./hr. These boilers selling at prices from £67 to £190 require no separate flue as they all operate on the balanced flue principle, and can be installed in the outside wall of a kitchen so that they do not project into the room, and are sealed off from it.

The Henry Wilson pressure-jet-fired boiler units range from 70,000 B.t.u./hr. to 160,000 B.t.u./hr., and cost from £149 to £200.

Allied Ironfounders Ltd., of Sunbury-on-Thames, Middlesex, also manufacture a range of pressure-jet-fired units, ranging from 70,000 B.t.u./hr. to 140,000 B.t.u./hr. output and costing between £120 and £170.

The cost of installing full central heating and the running costs differ



The Rippingilles Convector

with almost every individual house. The following is an approximate guide:

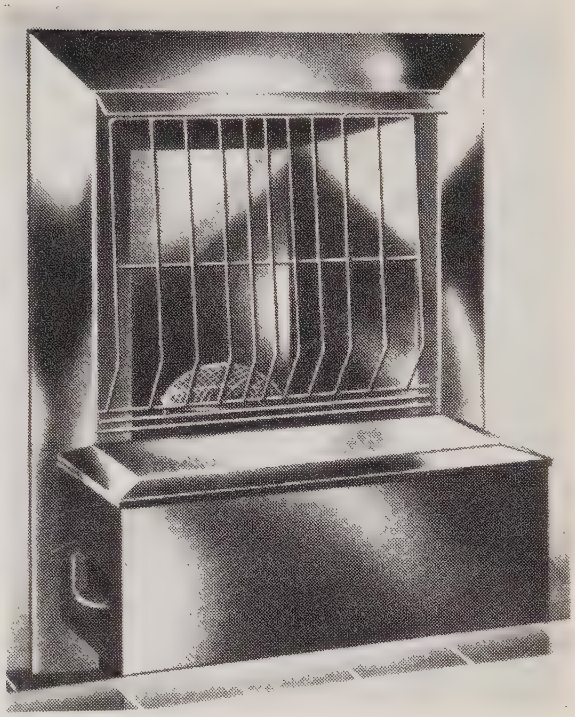
(*a*) Small two-bedroomed semi-detached house with two small and one large radiator and domestic hot water. Installation and all appliances about £295. Annual running costs under £1 a week.

(*b*) Medium-sized semi-detached house, three bedrooms with five radiators and hot water about £400. Annual running costs, about 22s. 6d. a week.

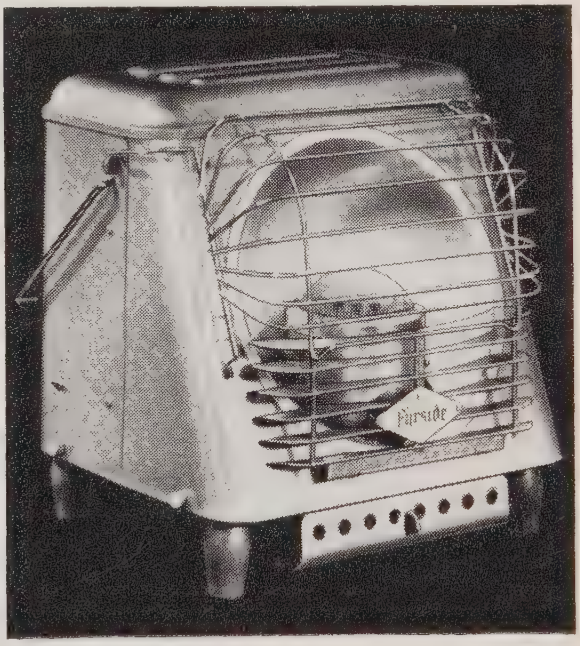
(*c*) Modern detached house of 1,250 sq. ft. superficial area with four bedrooms and eight large radiators and hot water, about £480. Annual running costs, about 30s. a week.

New Homes

The flued convectors already referred to may be built into small brick compartments in any small house to give a high level of home heating by warm air discharging through grilles in the central compartment to the rooms surrounding it together with domestic hot water service. Adequate heating in the bedrooms is obtained by the flow of warm air. This comprehensive system is one of the least expensive available and one borough council has already opened their first grant-improved house heated by this method. Many privately-developed estates also feature it.



The Leo-Fire (Lion Stamping Co. Ltd.)



The Rippingilles Fyrside

For the larger new house, ducted warm air heating can often be more economically installed than a water heated radiator system. One inexpensive example of this heater unit and system is made by Johnson and Starley Ltd., of Northampton. The approximate cost of installing such a system with nine warm air outlets for a three bedroomed house would be about £300, with an annual running cost of £55 to £65.

CLEAN AIR AT R.S.H. CONGRESS

Sunshine and blue skies were not the only reminders of the benefits of a smoke-free atmosphere for delegates attending the Royal Society of Health 1964 Congress at Torquay at the end of April.

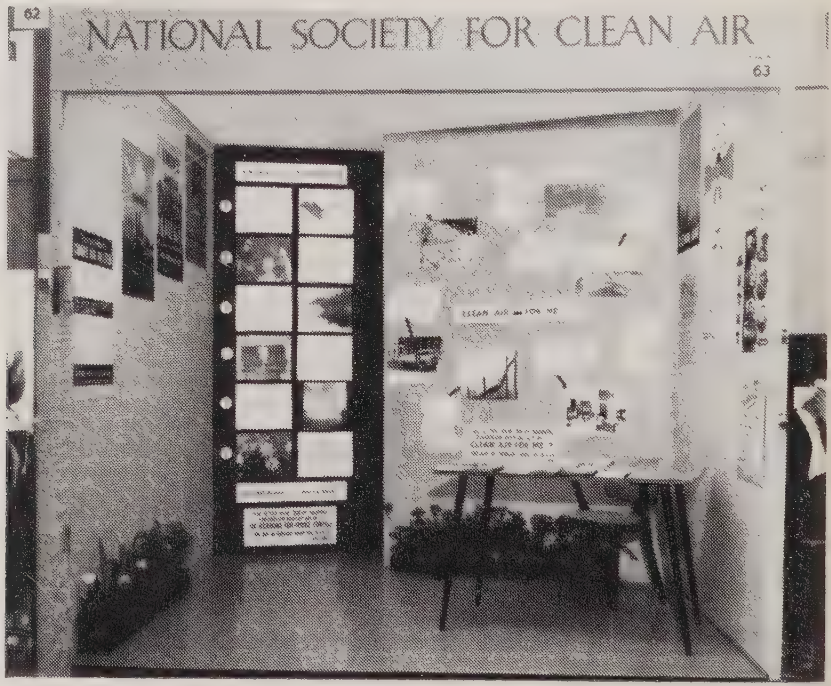
Delegates were able to watch the A.B.C. TV (New York) film "Smog—the Silent Killer" at one of the film sessions. This film, which was shown at the National Society for Clean Air Conference at Scarborough last year, tells the story of air pollution in London through the eyes of an American producer.

Mr. Kingsley C. Benham, F.A.P.H.I., recently-elected Chairman of the General Council of the Association of Public Health Inspectors and Chief Public Health Inspector of St. Thomas Rural District Council, in his Presidential address to the Public Health Inspectors' Conference, which forms part of the Congress, drew attention to the fact that, since the passing of the Clean Air Act, 1956, there had been a significant change in the methods of domestic heating, not only in smoke control areas but in the more urbanized rural communities.

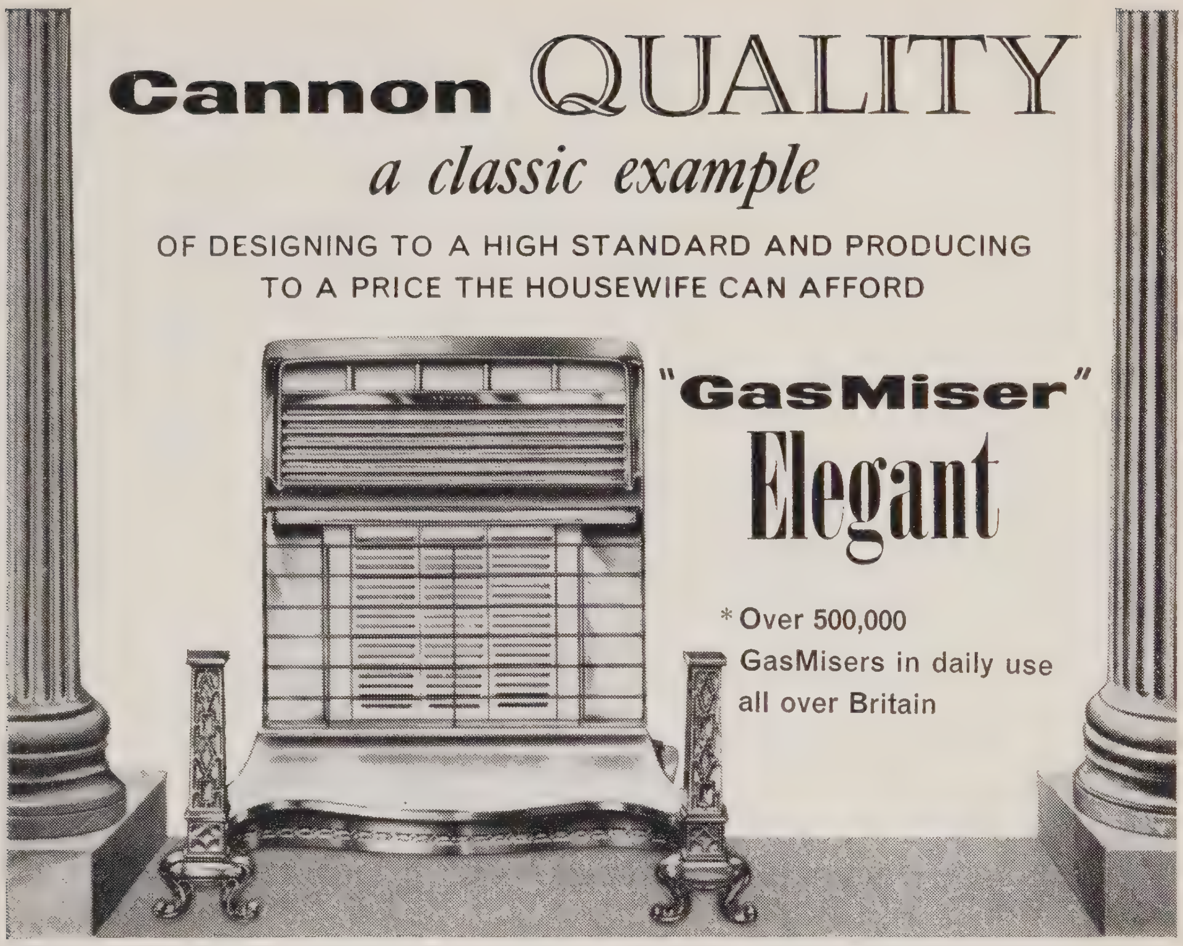
"The spread of the Clean Air concept," he said, "is having an effect on the content of house refuse; the proportions of clinker and ashes are slowly falling and the dust content rising slightly."

Mr. J. W. Batey, D.P.A., M.I.MAR.E., F.R.S.H., Chief Smoke Inspector, Sheffield and District Clean Air Committee, gave an interesting paper on "The Heating of Dwellings in relation to Smoke Control Areas".

In the Health Exhibition on the North Quay Car Park, the National Society for Clean Air displayed the two "Do-it-yourself" exhibition kits—"Six Reasons for Smoke Control" and "Clean Air for Me?" Visitors to the stand included a number of overseas delegates.



The Society's Stand at the RSH Torquay Exhibition



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20th - 23rd OCTOBER, 1964

EXHIBITION HALL, HARROGATE

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Exhibition plan and full details from: Exhibition Organizer, N.S.C.A.
Field House, Breams Buildings, London, E.C.4.

AIR POLLUTION ABSTRACTS

Abstracts of Papers on the Medical and Epidemiological Aspects of Air Pollution, presented at the International Symposium of the Royal Society of Medicine, London, April 10 and 11, 1964

731. Air Pollution as a Cause of Bronchitis. Professor D. D. Reid.

Much of the evidence on air pollution as a cause of chronic bronchitis is inevitably epidemiological and its value in this respect depends on several aspects of any associations found. These are—the closeness of the relationship between disease and pollution in time and space, the consistency of the associations found in similar but different circumstances, the uniqueness of the association and its coherence with evidence from laboratory and other sources.

Various types of epidemiological evidence—from mortality or morbidity statistics on field surveys—can be assessed against these criteria. First, however, the dominating influence of cigarette smoking and the social environment in the causation of chronic bronchitis has to be recognized. Once these factors are taken into account, a review of the results suggests that air pollution is a cause of chronic bronchitis in the sense that it appears to produce, in British urban conditions, a serious aggravation of the disease.

732. Morbidity and Mortality Statistics and Air Pollution. Dr. A. E. Martin.

This paper deals only with the acute effects of air pollution. Epidemiological investigations of the occasional severe polluted fogs of Greater London indicate a non-specific effect on patients already suffering from severe respiratory and cardiac lesions but have so far failed to show which contaminants are responsible. The effects are immediate and the maximum impact is usually within 24 hours. Investigations of day to day changes in pollution and methods of calculating mortality and morbidity indices to measure the effects of different levels of pollution are described. Individual observations are variable and significant results can only be obtained with very large populations. No threshold levels of toxicity can be defined and at the lower levels of pollution investigated the associated observations of mortality and morbidity merged imperceptibly with the mass of observations distributed around the mean. The ratio of smoke to sulphur dioxide in London is falling. It is hoped this trend will soon be sufficient to use the years 1958-60 as a base-line, and by the methods described in this paper, to assess changes in the toxicity of London's atmosphere.

733. International Comparisons of the Prevalence of Chronic Bronchitis. Dr. Torbjorn Mork.

The paper presents a broad outline only of present knowledge, but it is suggested that the seriousness of the disease is greater than previously believed. The importance of symptoms and of terminology is stressed.

734. Epidemiological Studies related to Air Pollution. A comparison of Berlin, N.H. and Chilliwack, B.C. Dr. Benjamin G. Ferris, Jr., and Dr. Donald O. Anderson.

A comparison of the prevalence of respiratory symptoms and the results of simple tests of pulmonary function in two communities with different air quality has shown some differences that cannot be entirely explained by differences in cigarette smoking habits. The residual difference is in the direction one would expect if air pollution were having an effect. On the other hand one is haunted by the spectre of possible ethnic differences that could explain this difference. It appears that future studies should be done comparing areas with more pronounced differences in air pollution. Also great care should be taken to standardize populations in respect of ethnic background as well as cigarette smoking habits.

735. Lung Cancer in South Africans and British Immigrants. Dr. Geoffrey Dean.

Comparisons have been made between the prevalence of lung cancer among the native born and immigrants from the United Kingdom to New Zealand, South Africa, Australia, the United States of America and the Channel Islands. For any particular level of cigarette smoking the British immigrant to these countries has a higher rate of lung cancer than the native born but a lower rate than occurs among the men who remain in Britain. The lung cancer mortality rates of South

African born White men living in rural areas of South Africa and smoking one to 20 cigarettes a day is very low, 13 per 100,000, and only a little higher than those of non-smokers.

These differences are evidence that there are environmental factors besides cigarette smoking which are also contributing to the high prevalence of lung cancer in Britain, such as air pollution, climate, high population density and repeated respiratory infections.

736. Air Pollution Research in Czechoslovakia. Professor Karel Symon.

Air pollution is a very grave health problem in industrial areas of Czechoslovakia, with high concentrations of smoke and sulphur dioxide which exceed several times the MAC values. In the vicinity of industrial plants, there are also found besides smoke and sulphur dioxide, many other toxic pollutants such as fluorine, arsenic, chlorine, carbon disulphide, etc. Research is aimed at the assessment of the damage done to the health of the inhabitants, domestic animals and flora. The results of an epidemiological investigation of the child population in the areas with high amounts of smoke, are described. Fluorosis was found to occur both in the inhabitants and domestic animals in the vicinity of an aluminium plant. Investigations are being started into the effect of arsenic and carbon disulphide on the population, and in selected towns of the amount of carcinogenic substances and the incidence of bronchogenic carcinoma. Attention is paid to chronic experiments in animals in order to explain the mechanism of the action of the pollutants on the living organism, and to meteorological research, especially that on mathematic methods and the formulae for calculating the dispersion of the pollutants.

737. Air Pollution Research in Italy. Professor A. Giovanardi, Dr. E. Grosso, Dr. E. De Fraja Frangipane.

The paper refers to data concerning air pollution (sulphur dioxide and suspended matter) in main Italian towns, Milan appearing to be the most polluted city from the measurements taken. There is a report on the relationship between pollution within premises used as dwelling places and the external pollution by sulphur dioxide and suspended matter. It has been found that the sulphur dioxide content of the confined air is usually considerably lower than that of the external air (up to 85 per cent) whilst the suspended matter has sometimes reached higher values. Three different epidemiological investigations are described and discussed. The study of death rates for respiratory diseases show a surprising fact that the highest death rates for chronic bronchitis have been observed in some districts of Southern Italy where air pollution is negligible. Other investigations show that increases in the morbidity for respiratory affections, and increases in the absences from work and aggravation of chronic bronchitis, coincide with the increase of the SO_2 and suspend matter concentrations. However as the high degree of pollution is almost always associated with unfavourable climatic conditions, it is difficult to state to which of the two factors the above-mentioned phenomena are to be ascribed.

738. Air Pollution in the Netherlands. Professor J. W. Tesch.

In the Netherlands the rapid transition caused by increasing industrialization and urbanization has consequences for the quality of the environment.

Several agencies are actively involved in these problems. Regarding the quality of the air besides activities of the Organization for Health Research T.N.O. and local groups (in the first place Rotterdam) the Central Government has set up an Inspectorate for Environmental Hygiene with specialists in problems of air pollution. A Council on Air Pollution has been set up by the Ministry of Public Health and Social Affairs.

From this country contributions have been given to the methodology of measurements and surveys. Some studies have been carried out or are in the planning phase. The study of the etiology, genetic environmental factors with its fundamental aspects, has lately been extended regarding the prevalence and natural history of chronic non-specific lung diseases.

Recently the consideration of norms has been given great attention by workers in this field. It is felt most important that the health aspects should be given preponderance, while local conditions need to be taken into account.

It is estimated that there are several criteria of dose response relationships; the decision as to what effect should be considered harmful may be based on three questions (qualitative, quantitative and on tolerance).

It is undesirable to promote or to accept limits of allowable concentrations which have not been proved adequate on a sound basis in connection with total air pollution.

739. The Air Pollution Problem in the United States. Dr. Harry Heimann.

The subject of air pollution is receiving a great deal of attention in the United States of America at the present time. This paper describes how interest developed in the subject of air pollution in that country.

The first reports that appeared there were in 1912-14 and were in reference to the pollution in the city of Pittsburgh, Pennsylvania, a heavily industrialized community. Sporadically, after that, there were special studies of pollution of a few industrial communities and of pollution caused by the automobile in the early days of its use. Not much attention was paid to the reports of these studies.

It was the acute episode of air pollution that occurred in Donora, Pennsylvania, in 1948 that served to draw the attention of the whole country to this subject. This interest was intensified by the clamour which came from Los Angeles as a result of the "smog" in the community. The paper outlines the situation in regard to both those instances.

Air pollution in the United States is now recognized as a problem in practically every large community. Efforts are directed toward the study of the effects of pollution on the health of people, on agriculture, and upon materials. Although the evidence is slow in accumulating, significant points are noted in this paper to indicate that the effects of air pollution are indeed significant in the United States.

Major efforts are now concentrated on control, although further studies continue on evaluation of the effects. It is noted that the passage of The Clean Air Act in December of 1963 will even further intensify the growing interest in this problem and the need for its control.

740. Air Pollution in Japan. Dr. H. Sakabe.

(1) Rapid development of industries, growth of cities and increase of vehicles after World War II resulted in the severe air pollution of many cities in Japan. The law controlling discharge of smoke was established in 1962.

(2) It is generally assumed that lung cancer and chronic bronchitis may have some relation to air pollution. Number of deaths by lung cancer is rapidly increasing but that by chronic bronchitis decreasing. Death rates due to lung cancer are high in some industrialized prefectures and in the district where coal is used as domestic fuel, but no such relation is found on chronic bronchitis.

(3) Recent rapid increase of oil consumption must be noticed from a viewpoint of air pollution. New problem of air pollution was brought about in Yokkaichi city where a big industrial combine of oil refineries, petrochemical works and power stations is located.

(4) Various methods for the measurement of air pollution have been studied. Aerosol register, which converts the photoelectric current produced by scattered light into digital form, was devised for the determination of particulate matter in the air. For the determination of 3,4-benzypyrene, new method utilizing vacuum sublimation and thin layer chromatography was established.

741. The National Survey of Air Pollution. Dr. Majorie Clifton.

The origin, design and purpose of this Survey, and the techniques used in sampling smoke and sulphur dioxide, are described.

742. Carbon Monoxide as a Test for Pollution in Paris due to Motor Vehicle Traffic. Dr. Henri Moureu.

The author reveals the reasons that brought him for some years, to keep carbon monoxide as a test for pollution due to exhaust gases of motor vehicles and he explains the method now used to follow the evolution of the average level of this type of pollution.

Researches were also carried out by means of a laboratory truck equipped with all the necessary scientific instruments; they allowed to prove by experiments that the variations of the amounts of carbon monoxide at a selected site closely follow the fluctuations of the motor-vehicle traffic. There is also a proportionality between this traffic and the average amount of lead in the air.

Systematic determinations of the proportion of carbon monoxide in the blood made on different kinds of inhabitants of the Parisian area during five years show that motor-vehicle drivers are always the persons who suffer the most important impregnation by carbon monoxide.

Finally, an operation performed in 1963 with 157 policemen, not smokers, showed that for 42 per cent of them, the proportion of carbon monoxide in the blood fairly increased during their five hours' duty; however, it remained definitely below the amount of 4·8 per cent of carboxyhaemoglobin considered as the "serious" level of the impregnation by carbon monoxide.

743. The Significance of Small Concentrations of Carbon Monoxide. Dr. Marie von Post Lingen.

Healthy young adults were experimentally exposed to low concentrations of carbon monoxide (CO) on a single occasion or repeatedly. Reactions were tested by measuring the critical threshold of flicker fusion in conjunction with evipan tolerance tests.

In these healthy subjects CO could produce a persistent central nervous effect of varying degree, which could be registered in evipan tolerance tests. A cumulative effect could arise from daily exposure to small concentrations of CO, producing 10 per cent to 11 per cent carboxyhaemoglobin. The clinically based assumption that protracted exposure to CO may modify individual sensitivity to CO was confirmed.

On the basis of complementary studies it is assumed that the effect of CO as registered by evipan tolerance tests is not wholly attributable to hypoxaemia, but is partly due to a specific action of CO. Suggested mechanisms are blocking of the active enzymes in tissue respiration, accumulation of intermediary products of metabolism and peripheral vascular reactions.

744. Physiological Effects of Acute Exposure of Human Subjects to SO_2. Dr. N. Robert Frank.

The effects of acute exposure to SO_2 on the mechanical behaviour of the lungs were studied in healthy volunteers. With one exception, there were no changes in pulmonary flow resistance in response to 1-2 p.p.m. of SO_2, a slight average increase in flow resistance to 5 p.p.m., and a greater response to 15 p.p.m. The changes in airway calibre did not coincide with symptoms of cough and throat irritation; the latter were largely dissipated at a time when the mechanical changes were maximal. The physiological response diminished if the exposure was prolonged for half an hour or if it was interrupted by a brief period of clean-air breathing. The effects of SO_2 were not potentiated by addition of submicronic saline aerosol to the airstream, as found in guinea pigs. SO_2 was almost completely absorbed by the nasal and pharyngeal mucosa during inspiration so that negligible amounts penetrated to the lower airways; during expiration some desorption occurred and SO_2 left the body. In dogs exposed to $S35O_2$, preliminary evidence indicates that S35 is excreted from the pulmonary capillaries into the lungs; this may be one means by which the lower airways ultimately become exposed to the SO_2 of polluted air.

745. Uses of Medical and Epidemiological Research in the Control and Prevention of Air Pollution. Dr. John R. Goldsmith.

Medical and epidemiological research intended particularly for evaluation of air pollution health effects provides the necessary information for scientifically valid air quality criteria and standards which may be used as a basis for regulations of existing pollutant emissions. Thus in California air quality standards for "oxidant" and for carbon monoxide have been used as a basis for control of motor vehicle emissions.

Air conservation represents a recent concept which is partly dependent on medical and epidemiologic research. It emphasizes the application of existing knowledge to planning for urban land use, transportation, industrial development and fuel and power use, with the goal of preventing air pollution.

Epidemiological studies of chronic disease effects of air pollution in the United States have been more complicated than in the United Kingdom because of population mobility and changing patterns of pollution exposure. Estimations of individual exposure levels for carbon monoxide are now practical and investigations for other pollutants are being undertaken.

Many of these problems are reflected in the differing points of view concerning use of sulphur-containing fuels for thermal power generating stations in Los Angeles. While no long-term effects of existing pollution levels in Los Angeles have been shown, if such effect did occur it would represent a serious failure to use available medical and epidemiologic information for protecting the public health.

GENERAL ABSTRACTS

746. A "Personal" Measuring Instrument for Atmospheric Sulphur Dioxide. Nash, T. (Int. J. Air Wat. Poll. Febr. 1964, 8, 121-124). The instrument was developed at the Medical Research Council, Air Pollution Research Unit, for the measurement of sulphur dioxide concentrations within the range 0·1-5 ppm.

It weighs about 1 kg. complete with battery and solution. Readings are taken by squeezing and releasing a flexible bottle, which aspirates air into a small conductivity cell containing dilute hydrogen peroxide solution. Fifty or more readings can be taken on one charge of solution, each reading taking about one minute.

747. Benzpyrene and Trace Elements in Air of a Large City. Hettche, H. O. (In German) (Int. J. Air Wat. Poll. March/April 1964, 8, 185-191). In Hamburg the dust from street atmosphere was collected for a period of 19 months and the weight of dust, ash, benzpyrene and trace elements, determined by gravimetric analysis. On the annual average of 1962, 1000 m³ of air contained 0·217 g. of dust of which 0·106 g. were soluble in methane. There were 100 μg of 3:4 benzpyrene and 76 μg of 1:2 benzpyrene. 3:4 benzpyrene showed a big difference between summer and winter with a range of 17 to 183 g. The same atmospheric dust measurements showed 2 mg. lead, 1 mg. each of zinc and copper, 0·5 mg. titanium and 0·2 mg. manganese. In the region of 0·1 to 0·01 mg. were vanadium, nickel, chromium, antimony and cobalt, with traces of molybdenum and beryllium. The seasonal variations are discussed and the concentrations compared with those of other localities. The relations between concentrations of benzpyrenes and trace elements and the diseases of the respiratory system are discussed.

748. Process Development in Removing Sulphur Dioxide from Hot Flue Gases. U.S. Dept. of the Interior, Bureau of Mines. **Part 1. Bench-Scale Experimentation.** Bienstock, D., Field, J. H., and Myers, J. G. In connection with air pollution studies the Bureau of Mines is co-operating with the U.S. Public Health Service in investigating the use of solids for removing SO_2 in concentrations of less than 0·5 per cent from combustion and waste gases. Removal at flue-gas temperatures would no longer result in the cooling of the scrubbed gas, which is inherent to liquid scrubbing processes used exclusively in industry today. Results are reported of extensive investigation, using metallic oxides as absorbents, and oxidation catalysts at 130° and 330°C. (temperatures at which flue gas may be treated in power plant practice). The most active absorbents tested were the oxides of manganese, cobalt, copper, and alkalized alumina.

Part 2. Laboratory-Scale Pulverized-Coal-Fired Furnace. Kurtzrock, R. C., Bienstock, D. and Field, J. H. This is the second in the series of four publications. It describes the design and operation of a laboratory-scale, pulverized-coal-fired furnace to furnish small quantities of flue gas for the air pollution investigation described. Specifications are given for a furnace capable of burning 1 to 4 lb. of coal an hour and producing 250 to 1,000 cu. ft. of flue gas an hour.

Members of the North East Division Council at Monkhouse Coke Oven Works on 23 April

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(Note: We regret that "News from the Divisions" has been held over until our next issue)

ELECTROSTATIC PRECIPITATOR FOR FOUNDRY FUME CLEANING

At a cost of £30,000, John Fowler and Co. (Leeds) Ltd., have installed a new fume cleaning plant at their Sprotborough Foundry, near Doncaster. This is a Visco-Beth installation, operating on the wet type electrostatic precipitation principle. This unit has been specifically designed with the steel industry's problems in mind and comprises a cylindrical tower wherein the fume is cleaned in two stages. The first stage of primary cooling, by means of a series of coarse sprays which draw their supply from the settling chamber arrangements, also removes the larger dust particles after which the fume passes through a series of very fine sprays before reaching the second and final stage of cleaning which is achieved by electro precipitation. Briefly this method removes the very fine particles from the gas stream by making use of ionic flow in a highly charged electrical field. The clean gas is then drawn from the unit by a two stage axial flow type fan carried from the top plate, and discharged to atmosphere through a short chimney at a height which avoids the need of a separate discharge chimney.

Before this equipment was chosen, John Fowlers spent three to four years on research into the most efficient way to clean the fume emitted from their foundry converters. The equipment had to satisfy the existing Alkali Inspectorate Regulations by reducing the fines containment in the gas emission to 0·05 grains per cu. ft. or less.

Fortunately, Fowlers have been directly associated with the British Steel Castings Research Association and have been represented on their committees through senior executives during joint consultations between the London Central Office of the Alkali Inspector, and the joint standing committee on the Clean Air Act set up by an association between the British Steel Castings Research Association and the British Steel Founders Association.

Co-operation between Fowlers and these official bodies resulted in an extended period of research and study into the efficiency of various types of prototype fume cleaning plants. At the end of this period it was decided that a wet type electrostatic precipitator of the kind used quite extensively in Germany would best meet the rigorous performance characteristics required.

On Tuesday, April 7, Dr. J. S. Carter, C.B.E., the U.K. Chief Alkali Inspector, officiated at the commissioning ceremony. Dr. Carter, who is due to retire shortly, has played a prominent part in successfully steering the negotiations between the industry and the Alkali Inspectorate over the past years. Local government interest in the event was considerable, and among those present were His Worship The Mayor of Doncaster, Councillor W. E. Whittington, and Mr. Greenwood, Chief Public Health Inspector of the County Council of the West Riding of Yorkshire.

A recent full-scale sampling test on the fume cleaning plant showed that the solids content of the fume varied between 0·014 and 0·033 grains per cu. ft. depending on the operating conditions. (Well under the design operating minimum of 0·05 grains per cu. ft.)

Potterton Developments

Thomas Potterton Ltd. have announced a number of major developments at their Warwick works, costing over £200,000. The foundry capacity for large boiler production has been doubled, and a smoke control plant, costing £25,000 has been installed. This is the first application of its type to a hot blast cupola in this country, and follows successful trials last year with a pilot plant.

Continuous Loading Smokeless Incinerator

Further improvements to their Kleen-aire Smokeless Incincerators are announced by Bering Engineering Limited of Camberley. The two larger models with capacities of 9·9 cu. ft. and 6·4 cu. ft. have been re-designed to incorporate an extra large loading door allowing them to be refilled when the incinerator is alight without the emission of smoke or flames, and an ash door is fitted to facilitate emptying.

The new Mark III range has three main advantages over previous models—with continuous loading the volume of rubbish that can be incinerated daily has been considerably increased; the ease with which the incinerator is filled makes it ideally suitable for use where female staff may be required to operate it; and lastly, it is now feasible to place it under cover fitting a suitable flue to the outlet.

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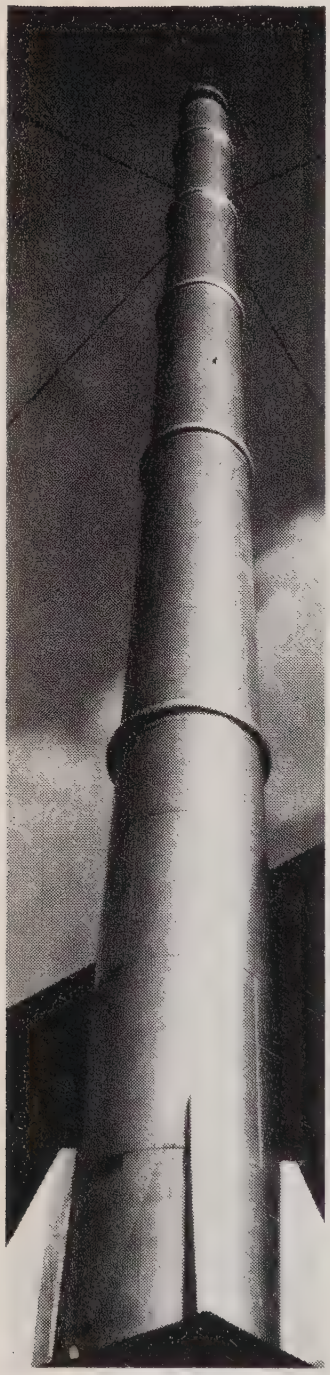

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clean air act

The Iron Fireman coal-burning Automatic Stoker will solve the problem of Smoke without the use of expensive fuels. The recognised method of burning bituminous coal is to use under-feed stokers, which are now an exempted class of appliance under a recent order made by the Ministry. Iron Fireman Stokers are thus being installed in many Smoke control areas throughout the country.

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"FIRST AND FOREMOST"

Automatic Coal Stokers

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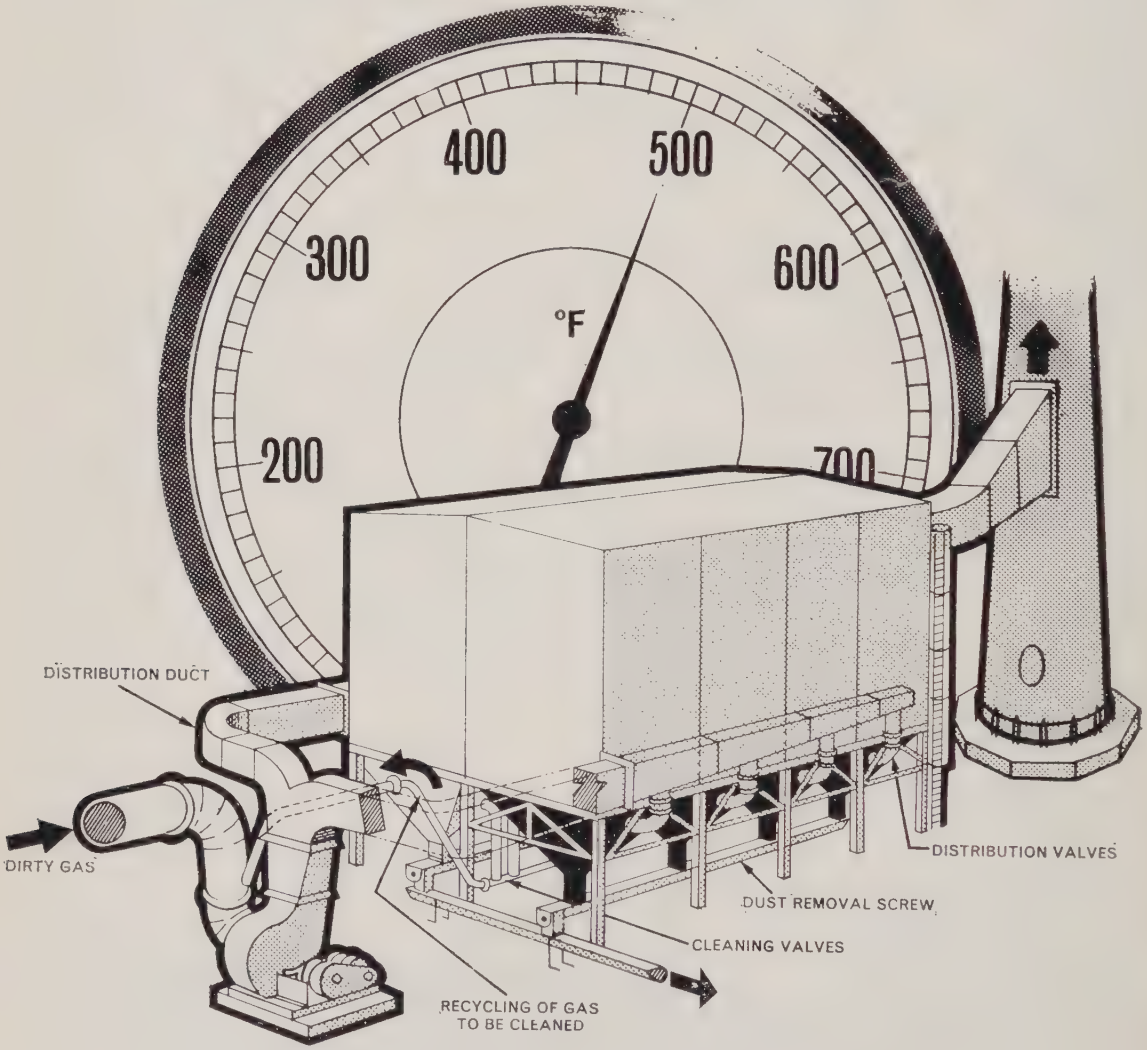
LODGE-COTTRELL DUST FILTERS CAN COPE AT 500°F

thanks to glass fibre sleeves with advanced filtering techniques



The glass fibre sleeves of the new Lodge-Cottrell fabric pocket dust filter enable it to cope with gases at temperatures of up to 500°F. The product of many years' research, this new filter is suitable for almost any dust or fume-producing process. It can be supplied in single or multiple-unit form and extra units can be added later if required. Designed and built to combine high efficiency with automatic trouble-free heavy-duty operation, it can be the economical solution to *your* high temperature gas cleaning and dust collection problems. Lodge-Cottrell also offer fabric pocket dust filters for operation up to 130°C.

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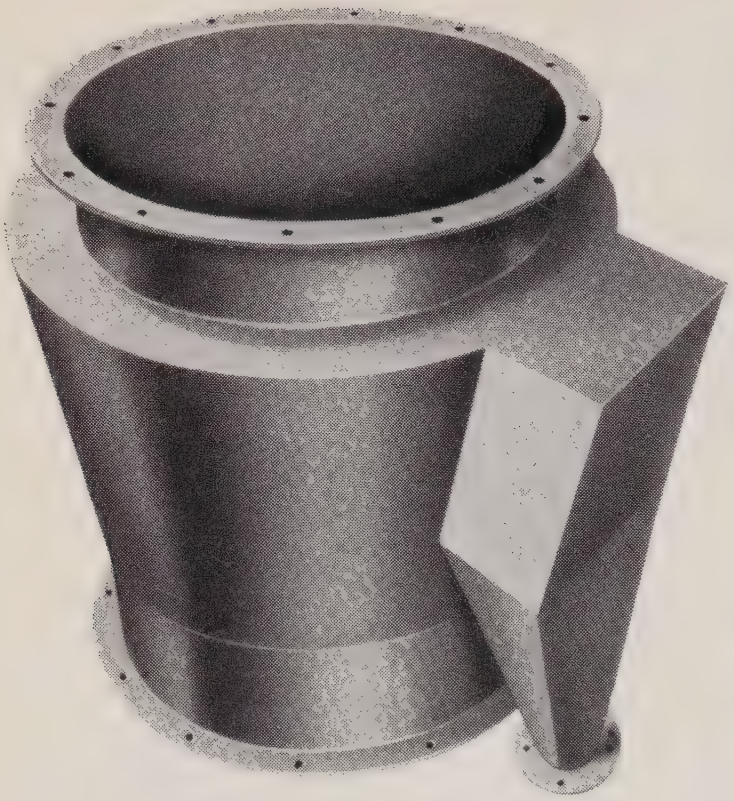

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Please write for Publication Ref. 518/63 containing full details

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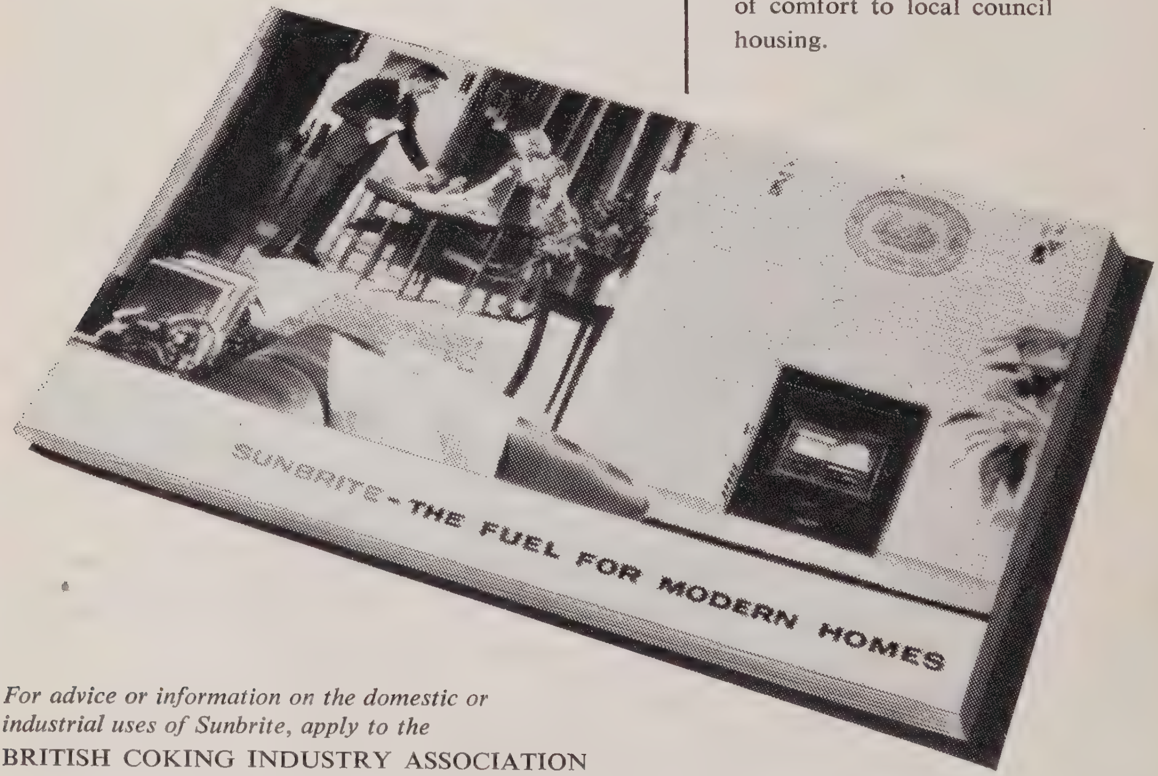

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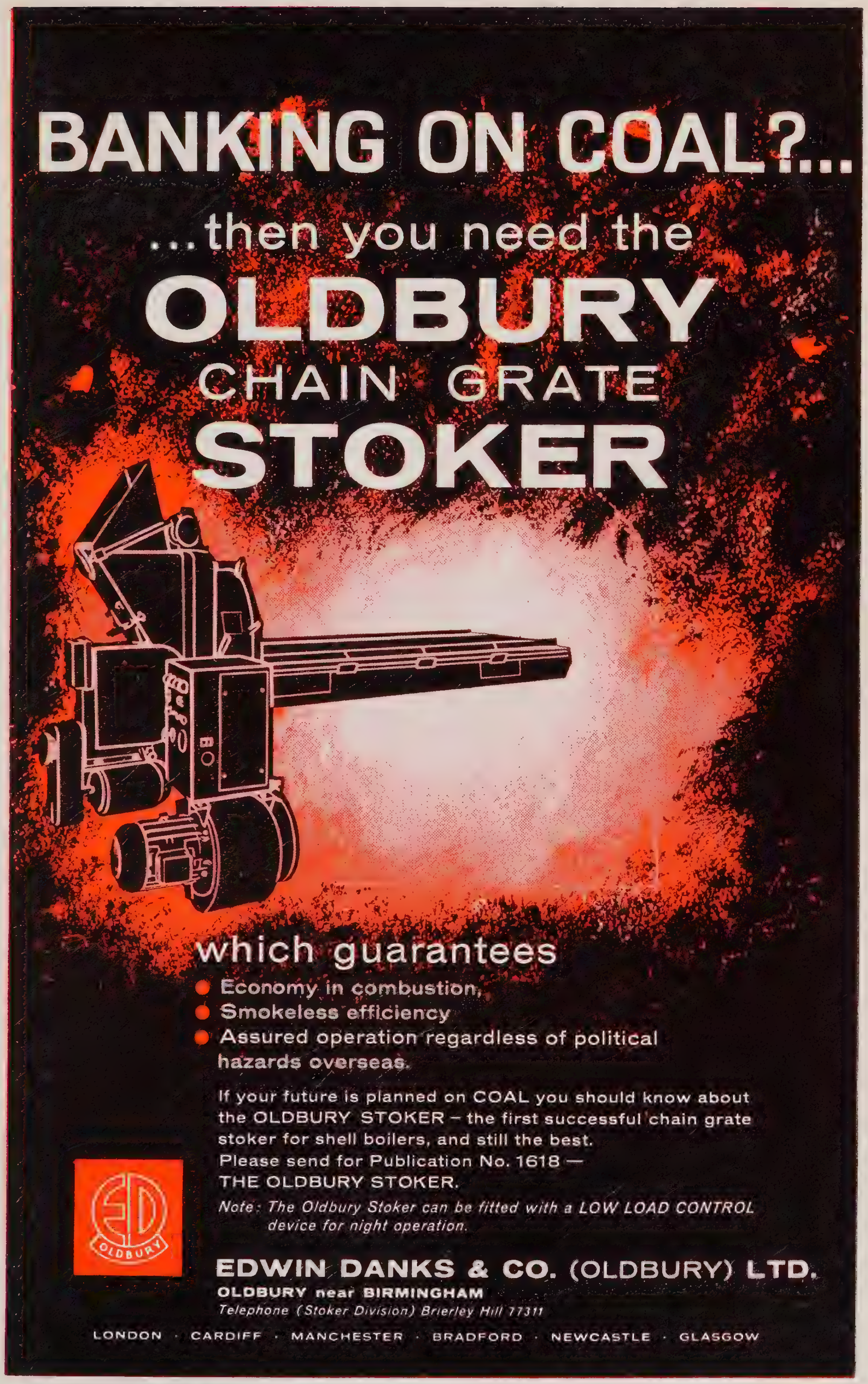

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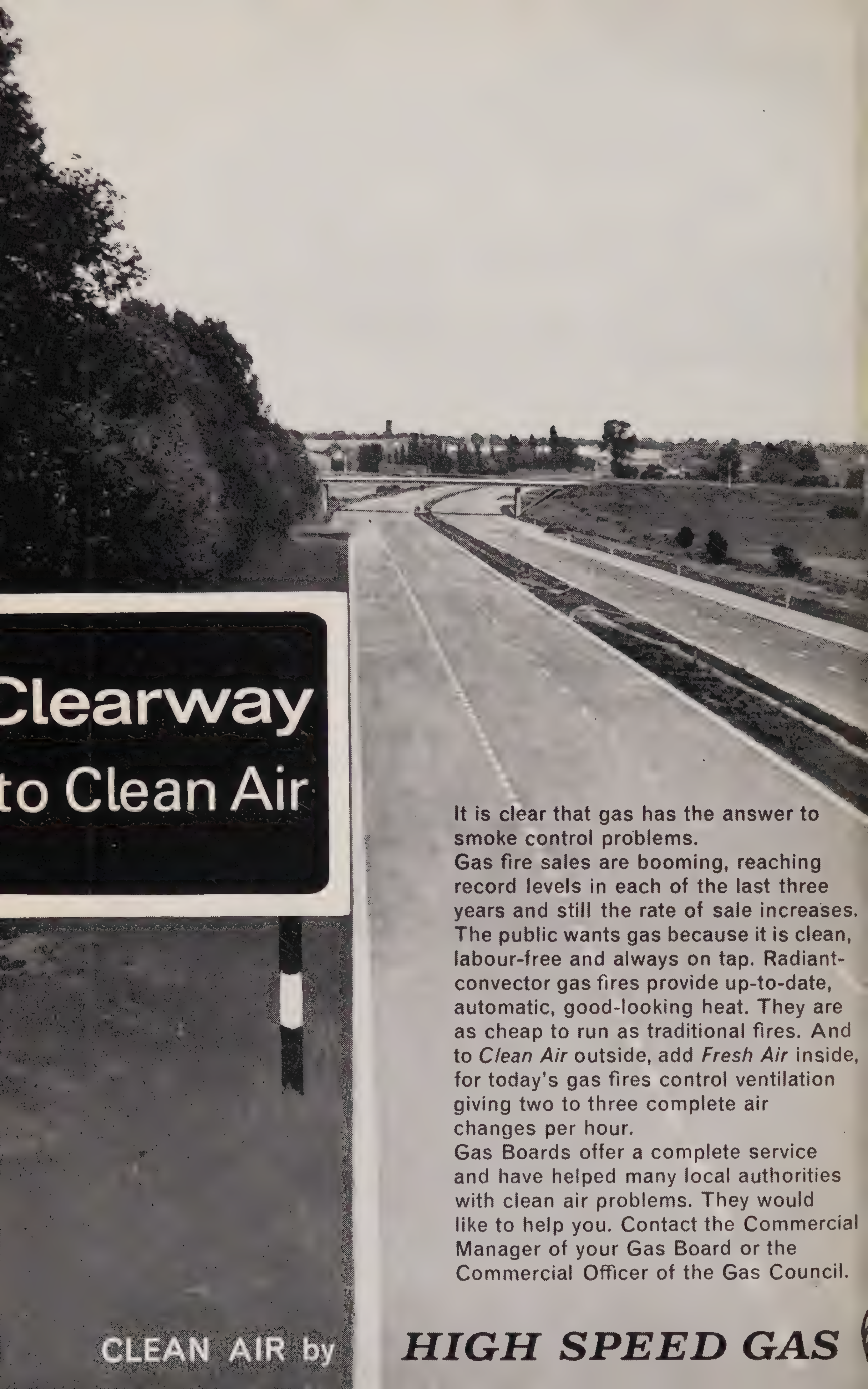

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